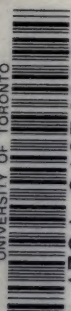



DISEASES
OF THE
NOSE AND THROAT

UNIVERSITY OF TORONTO



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SIR STCLAIR THOMSON



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DISEASES OF THE NOSE AND THROAT



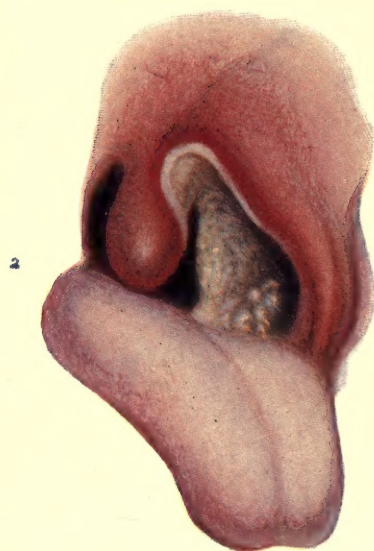
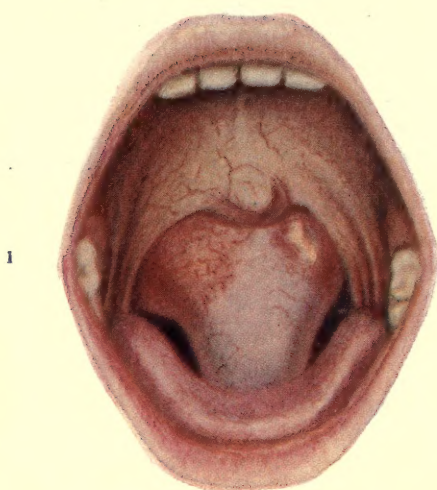


Fig. 1.--Polypoïd hypertrophy growing from the right ethmoid and descending into the pharynx. The removed growth is shown in Fig. 115, p. 235.

Fig. 2.--Tertiary ulceration of the fauces. (*See* p. 677.)

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DISEASES OF THE NOSE AND THROAT

COMPRISING AFFECTIONS OF THE
TRACHEA AND ŒSOPHAGUS

A TEXTBOOK FOR STUDENTS AND PRACTITIONERS

BY

SIR STCLAIR THOMSON

M.D., F.R.C.P.Lond. ; F.R.C.S.Eng.

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SECOND EDITION

WITH 22 PLATES AND 337 FIGURES IN THE TEXT

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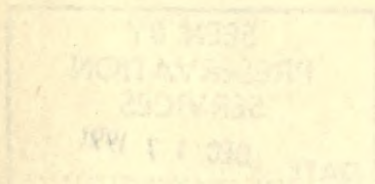
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"To study the phenomena of disease without books is to sail an uncharted sea, while to study books without patients is never to go to sea at all."—OSLER: *Books and Men*.

* * *

"La spécialité est le degré le plus bas de l'art, lorsqu'elle n'est pas fécondée par les connaissances générales; elle en est la perfection, lorsqu'elle est le couronnement de la science. Il faut finir au lieu de débiter par elle."—A. COURTY.

PREFACE TO THE SECOND EDITION

“Un livre est toujours un moyen de faire un meilleur livre.”

—MICHELET.

THE first edition of this textbook was published more than four years ago ; in the meantime rhino-laryngology has continued to make steady progress. The main design of the book has not been altered, but the work has been rigorously revised from beginning to end. I have introduced a description of suspension-laryngoscopy—the latest development in our methods of direct inspection of the larynx. The technique of nerve-blocking, to obtain laryngeal anæsthesia, is fully described and illustrated. Aspergillosis of the accessory sinuses and the indications for salvarsan have received more adequate consideration. The intranasal operation to secure drainage of the frontal sinus is described at length, with several fresh illustrations. An entirely new section has been written on intranasal dacryocystostomy, an operation which promises cure or relief in many troublesome conditions of the lachrymal apparatus. The nasal route to pituitary tumours also forms the subject of a new section. The chapter on removal of the tonsils has been entirely rewritten.

Some recent radiograms, by Drs. Ironside Bruce and Finzi, have been added, and many new illustrations have been introduced into the text. For some of these I am indebted to Drs. Le Bec and Courtenay Yorke, and to my friends W. Hill, Herbert Tilley, and Watson Williams.

STCLAIR THOMSON.

LONDON, *February*, 1916.

PREFACE TO THE FIRST EDITION

THIS book is based on personal experience. In writing it I have striven to keep two things constantly in mind: one, that it should serve as a guide to senior students; and the other, that it should prove a volume of ready reference for those engaged in the exercise of their profession. The experience gained during some years in general practice has, I trust, not only saved me from taking too narrow and too mechanical a view of the diseases of the air-passages, but has also helped me to realize their increasing importance in everyday work, and enabled me to supply such information and assistance as a practitioner is likely to require.

No attempt has been made to give a complete account of the anatomy and physiology of the regions studied, but special stress has been laid on the clinical and pathological bearings, and on the natural methods of defence and repair, to which many textbooks attach insufficient importance.

I have given a full description of symptoms and of diagnosis, and have made free use of diagrammatic sketches in order to elucidate the details of examination and treatment. If the description of local measures of relief should seem much more complete than that of general medicinal, dietetic, or hygienic measures, it is simply because the latter are fully dealt with in special treatises on general medicine. The surgery of rhino-laryngology has made astonishing progress in recent years, but, if judgment is to be sound and treatment successful, there will always be need for the wider purview of the general physician.

I am well aware that many operative measures can only be entrusted to the hands of the experienced specialist. Still, I have thought it well to describe them with some fullness, indicating those that might fall within general experience, and pointing out others that are fraught with particular danger

or require exceptional skill. It is only by placing before the practitioner a comprehensive study of the whole subject that he can be helped to determine what is amiss with his patient, what he himself can do for him, and what is the most he can expect from the assistance of a specialist.

The bibliography makes no pretence to completeness. References are inserted to confirm opinions advanced, to present views I may be unable to endorse, or to support conclusions on which, at present, experience is limited. In certain instances a reference is supplied to enable the reader, if he wish, to pursue the subject further. I trust that due consideration has been given to the opinions and experience of fellow-workers at home and abroad. If they are not all mentioned individually it is only because, nowadays, every fresh fragment of knowledge is so rapidly circulated that it soon becomes common property. The illustrations have been selected from a large collection. Most of them are original; the others have been included because they represent a typical condition or because of their instructive character. I am extremely indebted to Dr. Dupuy, Mr. T. P. Collings, and Mrs. Taylor for their skill and for the care they have taken in making drawings under my directions. My friend Dr. Smurthwaite has kindly permitted me to print several of his original coloured drawings, and Mr. A. D. Reid has supplied me with excellent radio-grams. My warmest thanks are due to Sir Felix Semon for the loan of some instructive coloured plates, illustrating cancer of the larynx. These appeared in the *Transactions* of the last International Congress of Medicine, but only now, for the first time, are they made generally available. I have also to thank the Royal Society of Medicine, the Schools of several London Hospitals, the Council of the Royal College of Surgeons, Messrs. W. B. Saunders Company, and several personal friends for permission to make or to reproduce individual illustrations mentioned in the text. In preparing the index, Mr. Archibald Clarke's well-known skill has been kindly placed at my disposal.

ST. CLAIR THOMSON.

LONDON, May, 1911.

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DISEASES OF THE NOSE AND THROAT

PART I.—INTRODUCTORY

CHAPTER I

EMBRYOLOGY AND PHYSIOLOGY

I. DEVELOPMENT OF THE NOSE, PHARYNX, AND LARYNX

SOME knowledge of embryology is necessary in order to understand the congenital defects and certain pathological conditions of the air-passages. In a work like the present, however, only the merest outline is possible, and for more detailed information reference should be made to special treatises on the subject.*

It will be seen, by a reference to Fig. 1, that the primitive mouth or stomodæum is formed by the invagination of the epiblast until it meets the anterior end of the foregut (the future pharynx).

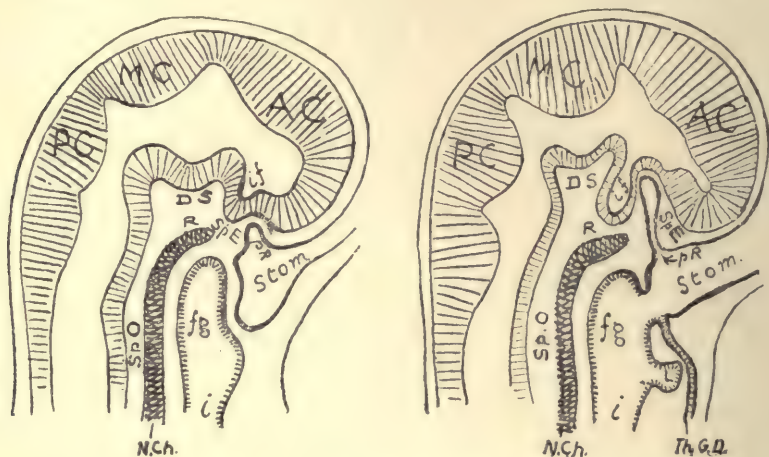
From the stomodæum a diverticulum—the pouch of Rathke—passes up to the sella turcica (Fig. 2, *p.R.*), where it meets with a similar pouch from the third ventricle of the brain (*i f*). Their fusion forms the pituitary body, while the rest of the lower diverticulum remains open at first in the embryo. Later, its orifice is lost, but probably would be situated at the base of the septum nasi, or down its free posterior border. The lingual and palatine tonsils of Waldeyer's ring are formed from the mesoblastic area of the second arch and the cleft behind it; the pharyngeal tonsil is a mesoblastic thickening in the roof of the pharynx, round the recessus medius, which is a depression—perhaps connected with

* His, "Anatomie menschlicher Embryonen." Leipzig, 1885.

the notochord—placed a little distance behind the junction of stomodæum and foregut.

A study of Fig. 2 will explain the origin of the thyro-glossal duct, the appearance of cysts in the middle line over the front of the thyroid cartilage (*see* p. 755 and Fig. 302), and the occurrence of accessory thyroid growths at the base of the tongue (*see* p. 423).

The lingual tonsil is formed around this thyro-glossal diverticulum.



Figs. 1 and 2.—The embryological air-passage.

Stom., stomodæum; *fg*, foregut; *p.R.*, pouch of Rathke; *if*, infundibulum; *Th.G.D.*, thyro-glossal duct; *A.C.*, anterior cerebral vesicle; *M.C.*, middle cerebral vesicle; *P.C.*, posterior cerebral vesicle; *D.S.*, first cephalic flexure; *N.Ch.*, notochord; *Sp.O.*, postsphenoid, and *Sp.E.*, presphenoid developmental centres, from which respectively develop (a) the bones of the cranial base as far forward as the sella turcica (i.e. the speno-occipital portion of the basis cranii), and (b) the presphenoid or speno-ethmoid portion; *R*, the investing mass of Rathke.

(Kindly lent by Dr. Watson Williams.)

The nose and mouth in early foetal life constitute one chamber. About the eighth week a maxillary process grows horizontally inwards from each lateral wall of this oro-nasal cavity, so as to form a partition between the nose and the mouth. On each side a median fronto-nasal plate descends from the frontal region, their lower ends dividing to form the primitive nasal pits (Fig. 3). These pits at first correspond to the vestibule, and are closed at the bottom by a layer of involuted epithelium. Failure of this fleshy septum to disappear would leave a membranous obstruction between the vestibule and the nasal chamber proper (*cf.* p. 120).

Imperfect union of the fronto-nasal plates in the middle line

accounts in after-life for a depression, a bifid tip to the nose (Fig. 4), teratoma of the nose, and other nasal deformities.*

The descending fronto-nasal plates carry the two central incisor teeth and form the front part of the hard palate, which is called the premaxilla or intermaxillary bone. In the developmental defects of mouth-breathers this bone is thrust forward, and the central incisors project and overlap † (cf. "Mouth-Breathing," p. 92).

The septum is formed from a centre on either side extending

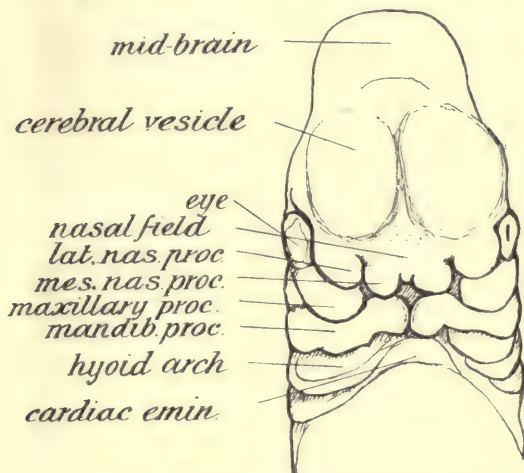


Fig. 3.—Showing the formation of the face by the nasal, maxillary and mandibular processes in an embryo of the fourth week. (After His.)

forward from the presphenoid centre. If they fail to coalesce, the cartilaginous septum in after-life will be split lengthwise (see description of Fig. 4).

The Eustachian tube is developed from the cleft between the first and second visceral arches.

In the lower part of the cleft between the second and third arches is formed the sinus tonsillaris. The faucial tonsil is formed by invagination of the hypoblast into the sinus tonsillaris. Across this, in foetal life, is stretched the anterior palatal pillar, forming a triangular fold which more or less covers the socket in which the tonsil develops, and may remain in after-life as the plica triangularis (p. 364).

* A. MacLennan, *Brit. Med. Journ.*, Dec. 19, 1903.

W. R. H. Stewart, *Lancet*, March 27, 1897.

Arthur Keith, *Brit. Med. Journ.*, Aug. 7 and 14, 1909, pp. 310 and 363.

Georges Laurens, *Bull. de la Soc. de Laryngol. de Paris*, 1914, No. 2, p. 27.

† "A rabbit mouth that is ever agape" (Tennyson's "Maud").

The larynx.—The floor of the primitive pharynx shows five "visceral arches" running to a central longitudinal ridge. The 4th and 5th arches run forward and inward to the hinder end of this ridge, so that the 5th has the 4th antero-externally to it. (Fig. 5.)

The pulmonary opening is between the two 5th arches, and is



Fig. 4.—Congenital deformity of the nose.

Photograph of an infant 8 months old. There is no nasal obstruction. The two sides of the cartilaginous septum were evidently separated from each other, the anterior ends being visible as prominent ridges on the inner side of each vestibule. There was also a well-marked notch in the middle line of the alveolar process.*

converted into a sagittal slit by their rapid growth. The true cords are formed in the margins of this slit, and the arytenoid and cricoid cartilages in the masses of the 5th arches.

* G. Wilkinson, *Proc. Roy. Soc. Med.*, Laryngol. Section, Feb. 4, 1910.

The arytenoid prominences are due to the growth of the 5th arches, standing up behind the end of the central mass, and these, with the accompanying upgrowth of the adjacent 4th arches, make the back wall of a transversely disposed cavity, the laryngeal cavity, above the true cords. This part is bounded in front by the central mass, forming the epiglottis and containing 4th and 3rd arch elements; the continuity between this and the upgrowing lateral 4th arch makes the ary-epiglottic fold, while the 3rd arch element is shown in the pharyngo-epiglottic fold.

The thyroid cartilage is a condensation in the 4th arch on each side of the 5th arches; the two halves chondrify and join ventrally

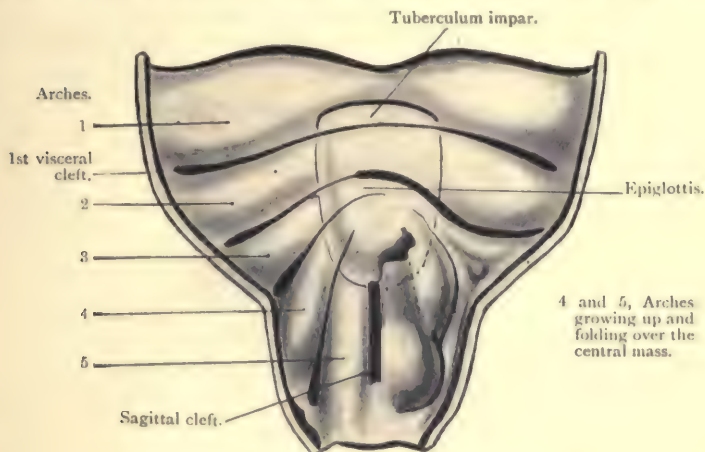


Fig. 5.—The development of the larynx.

Schematic sketch showing on the left side of the picture the arrangement of the visceral arches, and on the right side their relations to the larynx.

early in the third month. The internal muscles, at first a circular constrictor, belong to the 5th arches (recurrent laryngeal nerve), and the crico-thyroid is part of the 4th arch (inferior constrictor) muscle, cut off by the downgrowth of the lower cornu.

The cavity of the larynx which lies above the level of the true vocal cords (suprarimal part) is really part of the pharynx. The rima glottidis and true cords represent the original orifice of the pulmonary tract. During the latter part of the first month and the earlier part of the second month the primary orifice of the pulmonary system undergoes a migration forwards. It is during this migration that the hinder part of the pharynx is divided so as to form the trachea in front and the upper part of the œsophagus behind. Congenital imperforation of the œsophagus (p. 599) is produced by an irregular division of the hinder part of the pharynx during embryonic life.

The true cords are modifications of attachments of cell-masses which become almost precartilaginous before they atrophy.*

* J. Ernest Frazer, *Journ. of Anat. and Phys.*, xlv.

II. DEFENSIVE ARRANGEMENTS OF THE UPPER AIR-TRACT

The three chief **functions of the nose** are olfactory, respiratory, and vocal, but it also serves as a drainage cavity to the accessory sinuses and the lachrymal secretion, and as a ventilating shaft to the Eustachian tube. As all savours are perceived by the nose, it is largely concerned with many of the sensations ascribed to taste, and it even takes a share in deglutition. The nose is also endowed with highly important powers for the defence, not only of the air-passages, but of the body generally. These defensive

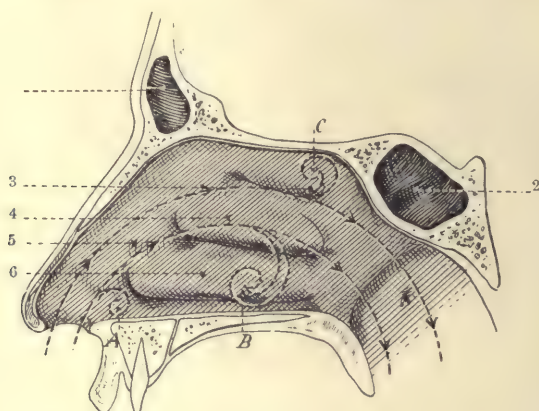


Fig. 6.—The air-currents of the nose.

A diagrammatic figure showing the path of the air-stream through the nose. 1, Frontal sinus; 2, sphenoidal sinus; 3, superior turbinal; 4, middle turbinal; 5, entrance to the middle meatus; 6, inferior turbinal. The path of the air-stream is indicated by the dotted lines. *A*, *B*, and *C* represent three whorls or eddies. It is seen that the air in inspiration does not take a straight course along the inferior meatus, but ascends in a curved direction into the middle and superior meatus, and then gradually descends towards the choanae. Hence nasal stenosis may be complained of if the middle meatus is blocked, even when there is a free air-way below this level. Expired air travels chiefly along the inferior meatus; hence the difficulty of blowing secretion from the nose until it has reached the floor of the cavity. (*Lambert Lack.*)

arrangements will be studied best in association with the protective arrangements in the pharynx and larynx, and it will be convenient to consider the respiratory functions of the nose at the same time.

The air-stream does not pursue a straight course through the nose, but passes in the curves and eddies shown in Fig. 6.* This

* Goodale, *Boston Med. and Surg. Journ.*, Nov. 5, 1896.
Scheff and Kayser, *Journ. of Laryngol.*, ix., 1895, p. 64.

extended exposure to the convoluted surfaces of the nasal cavity promotes the warming, moistening, and purifying of the inspired air before it passes to the throat and lungs.

The vascular erectile tissue, found on the middle and inferior turbinals and the anterior part of the septum, supplies the heat and moisture by which the air is (1) raised to the temperature of the blood, and (2) saturated with moisture before the pharynx is reached. This self-regulating mechanism provides for those two functions, whatever the temperature or humidity of the outside air may be, the turbinals varying in size according to the general health and the atmospheric conditions. It has been estimated that in twenty-four hours over a litre of water is supplied by the nose, and there are no arrangements in the mouth, pharynx, or wind-pipe for the secretion of any such quantity. This explains the dryness and tendency to catarrh in these regions, and the injury which may result to the bronchi and lungs when the functions of the nose are impaired.*

The nose, in normal conditions, filters off all dust and micro-organisms from the air before they can reach the larynx. The grosser particles of dust and large numbers of floating organisms are caught in the vibrissæ which line the vestibules. These regions are always swarming with organisms—fortunately, few of them are pathogenic. Those microbes which do gain access to the nasal cavity proper are expelled by the action of the ciliated epithelium, assisted by the trickling of the lachrymal secretion and the mucus in which they become enmeshed. Before expulsion, their activity is arrested by the nasal mucus, which is inhibitory (Thomson and Hewlett), if not actively bactericidal (Wurtz and Lermoyez), and leaves them open to attack by phagocytes.† Even when cultures of non-pathogenic organisms are artificially introduced into the nose, they disappear rapidly. Hence, while micro-organisms are abundant at the entrance to the nose, they are scantily met with in its interior, and are practically all filtered off before the

Franke, *Arch. f. Laryngol.*, 1894, i., p. 230.

Burchardt, *ibid.*, xvii., 1905, p. 123.

Réthi, *Wien. med. Presse*, 1900, Nos. 48 and 49.

C. A. Parker, *Journ. of Laryngol.*, xvi., 1901, p. 345.

* Aschenbrandt, "Die Bedeutung der Nase für die Atmung," Würzburg, 1886.
Kayser, "Die Bedeutung der Nase für die Respiration," *Pflüger's Arch.*, Bd. xli., 1887.

Bloch, "Zur Physiologie der Nasenatmung," *Zeitschr. f. Ohrenheilk.*, Bd. xviii., 1888.

MacDonald, "Respiratory Functions of the Nose." London, 1889.

Schütter, *Ann. des Mal. de l'Oreille*, xix., April, 1893, No. 4, p. 334.

Freudenthal, *Journ. of Amer. Med. Assoc.*, Nov. 9, 1895.

Kelly, A. Brown, "Nasal Thermometry," *Journ. of Laryngol.*, xxviii., 1913, No. 10, p. 515.

† Piaget, Thèse de Paris. 1896.

air reaches the naso-pharynx.* The accessory sinuses, in animals at least, are nearly always sterile.†

The importance of these bactericidal functions is realized by remembering that at least 10,000 litres of air pass through the nose in twenty-four hours;‡ that at the lowest estimate 1,500 organisms are inhaled into the nose every hour; and that it must be a common event for 14,000 organisms to enter during an hour's tranquil respiration.§ It also emphasizes the necessity of respecting the erectile tissue of the nose, as the ciliated epithelium, when once destroyed, is never renewed. It is better to be a partial mouth-breather than to have free nasal passages with these protective mechanisms seriously damaged.

When the functions of the nose are interfered with, these protective powers are weakened. Still, when mouth-breathing becomes necessary, any organisms which are deposited on the pharyngeal mucous membrane are at once enmeshed in mucus and swept into the stomach with the saliva, of which 1 to 3 lb. may be secreted daily. The gastric juice neutralizes most of them. But in the pharynx there is another line of defence to the body, supplied by the tonsils. The "ring of Waldeyer" is the name given to the distribution of lymphoid or adenoid tissue grouped around the cross-ways where the air and food passages intersect each other. Adenoid tissue, widely distributed in the upper air-passages, consists of a delicate reticulum of connective tissue filled with lymph-cells or leucocytes. These leucocytes may be uniformly diffused, or collected into small clusters called follicles. These, in their turn, may be grouped into larger masses, which are then called tonsils, arranged as follows (Fig. 7): 1. The palatine tonsils face one another, lodged between the pillars of the fauces, and are commonly referred to as *the* tonsils (*P,P*). 2. The group of follicles in the roof of the naso-pharynx are united in one mass in the middle line, and form the third or pharyngeal tonsil, or tonsil of Luschka, commonly referred to as adenoids, postnasal growths, or adenoid vegetations (*Ph*). 3. At the base of the tongue, on each side of the middle line, and lying in front of the valleculæ, are the flat masses of lymphoid tissue known as lingual tonsils (*l*). Some authors give the name of tubal or Eustachian tonsil to the accumulation of

* StClair Thomson and R. T. Hewlett, *Med.-Chir. Trans.*, lxxviii., 1895.
 Frederic C. Cobb and E. V. Nagle, *Trans. Amer. Laryngol. Assoc.*, 1909, p. 73
 J. Wright, *N.Y. Med. Journ.*, July 27, 1889.
 Park and Wright, *ibid.*, Feb. 5, 1898.
 A. Logan Turner, *Edin. Med. Journ.*, Nov., 1905.

† Bertarelli and Calamida, *Archivio Italiano di Otol.*, xiii., fasc. 1.

‡ M. Duval, "Physiologie." 1897.

§ StClair Thomson and R. T. Hewlett, *Lancet*, Jan. 11, 1896.

lymphatic follicles to be found on the posterior lip of the orifice of the Eustachian tube (*e*). Passing down from here, on each side, is a strand of lymphatic tissue, which, when prominent, may give rise to lateral pharyngitis (p. 428).

These groups of tonsils are united to form the "ring of Waldeyer" by tracts of mucosa containing well-marked infiltrations of lymphoid tissue.* Even in the larynx, there is a distinct collection of adenoid tissue in the submucosa of the laryngeal ventricle.†

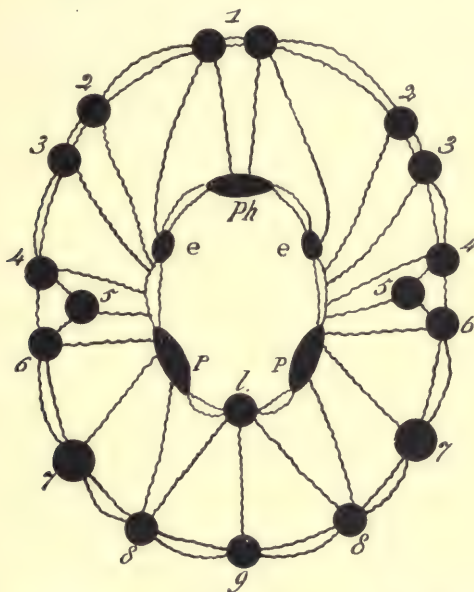


Fig. 7.—Diagrammatic arrangement of Waldeyer's ring.

P, P, Palatine tonsils; *Ph.*, pharyngeal tonsil; *e, e*, Eustachian tonsils; *L*, lingual tonsil. 1, Retro-pharyngeal glands; 2, styloid glands; 3, lateral pharyngeal glands; 4, glands along posterior edge of sterno-mastoid; 5, glands at the bifurcation of the carotid; 6, glands along anterior edge of the sterno-mastoid; 7, submaxillary glands; 8, hyoid glands; 9, median subhyoid gland. (*Escat.*)

Tonsils, therefore, are composed of lymphatic cells, collected into groups called follicles, and separated from one another by areas of connective tissue. The surface of the tonsil is generally irregular, being indented with crypts, or lacunæ, or with sulci. Into these open the ducts of the muciparous glands, which are

* Waldeyer, "Ueber den lymphatischen Pharynx Ring," *Deut. med. Woch.*, 1884, No. 20.

Chauveau, *Arch. Internat. de Laryngol.*, 1903, No. 1, p. 36.

† Foianini, *Archivio Italiano di Otol.*, xv., Nov., 1903, fasc. 1.

situated in the stroma of the tonsils, below the level of the follicles.

The epithelial covering varies with the situation. Thus, the palatine and lingual tonsils are covered with flat epithelium. The naso-pharyngeal tonsil in the normal condition is covered with ciliated epithelium, but when chronically enlarged or inflamed this assumes the flat type.

The **function of the tonsils** is not fully settled. Amongst the theories advanced, it is suggested that they (1) are residual embryonic remains, more or less useless and even dangerous to the organism; * (2) have a particular secretion; † (3) exert a physical action; ‡ (4) secrete a mucus which facilitates deglutition by lubricating the bolus of food; (5) manufacture an internal secretion (Masini); (6) act as blood-forming glands.

The marked development of the tonsils in the later months of intra-uterine existence, and their tendency to disappear after the first few years of life, speak in favour of their rudimentary character. § The fact that their development varies so much in different individuals, and in the same individual at different periods of life, shows that the rôle they fulfil as lymphatic glands is not a large one, especially when compared with the large number of similar glands in the body.

It would appear reasonable to regard the various tonsils of Waldeyer's ring as organs for the defence of the respiratory and digestive tracts during the early years of childhood. The ages in which they are most in evidence, their situation, their structure, the recognized emigration of lymphocytes through their epithelium, their frequent enlargement with an infectious process, the frequency with which, when their resistance is overcome, they appear to be the starting-points of infection, their lasting hypertrophy after prolonged or repeated infections, experimental observations which show that they serve as ports of entry for infection, and their normal involution at puberty, appear to confirm this view. || There exists a direct lymphatic communication between the nose and the tonsils, and also between these and the gums. This constant

* Pluder, *Monatsschr. f. Ohrenheilk.*, 1898, No. 4, p. 164.

† Bosworth, "Diseases of the Nose and Throat," p. 380, 3rd ed. London, 1897.

‡ Fox, *Journ. of Laryngol.*, 1887.

Scanes Spicer, *Lancet*, 1888. i.

§ Gradenigo, "Patologia e Terapia dell' Orecchio e delle Prime Vie Aeree," Turin, 1903, p. 22.

|| Kayser, *Journ. of Laryngol.*, xiii., April, 1898, p. 200.

Goodale, *Arch. f. Laryngol.*, Bd. vii., Heft 1.

Heldeson, *ibid.*, Bd. viii., S. 477.

Pirera, *Archivio Ital. di Larin.*, xx., 1900, p. 67.

R. H. Good, *Laryngoscope*, xix, No. 6, June, 1909, p. 438.

lymph current to the free surface of the tonsils may act as a defensive mechanism against the entrance of micro-organisms, and interference with it may help to explain some tonsillar infections.*

The enlargement of the chain of lymphatic glands with which they connect is the effort of nature to raise a second line of defence (Fig. 7).† There is no evidence that the tonsils act as blood-forming glands.

The olfactory and sensory nerves of the nasal chambers assist in the defence of the organism by putting us on our guard against evil-smelling or irritating bodies, or by hastening their expulsion by increased lachrymation and sneezing. The inclination to expectorate after inhaling an offensive odour is probably a defensive instinct. The reflex expulsion of an irritant from the pharynx by "hawking," or from the larynx by coughing, are other defensive arrangements.

In the larynx the vocal cords are unprovided with protecting ciliated epithelium, but with each act of deglutition the cords are compressed together, and the flow of mucus from the ventricles of Morgagni is driven across their surface towards the œsophagus, clearing away with it adherent impurities. In the trachea and larger bronchi there are stockades on stockades of ever-active cilia, prepared to deal with any micro-organisms which may on rare occasions penetrate so far.

The importance of studying these defensive arrangements, and preserving them in full activity, is emphasized by observations which show that most generalized diseases in children take origin from the respiratory tract rather than from the intestinal.‡ Death from tuberculous disease beginning in the abdomen is comparatively rare in young children (J. W. Carr), and the most potent cause of tuberculosis in infants is infection through the respiratory passages (G. F. Still).§

The strength of these lines of defence is shown by the arrest in the front of the nose of tubercle bacilli. Although they generally fail to infect their host, the organisms, trapped here, may retain full virulence.||

* F. Henke, *Arch. f. Laryngol.*, xxviii., Heft 2, and *Journ. of Laryngol.*, xxix., Sept., 1914, p. 476.

† "The Lymphatic Apparatus of the Nose and Naso-Pharynx," by Henry J. Hartz, Camillo Poli, and A. Logan Turner, *Laryngoscope*, xxii., 1912, No. 3, pp. 165-228.

‡ W. Hunter, *Brit. Med. Journ.*, May 14, 1904.
Czerny and Moser, *Jahrb. f. Kinderheilk.*, xxxviii., S. 430.
Fischl, *Sammlung klin. Vorträge*, N.F., No. 220.

§ J. W. Carr, *Trans. Med. Soc., London*, 1894.
J. W. Carr, *Brit. Med. Journ.*, Sept. 2, 1899.
L. Guthrie, *Lancet*, 1899, i., p. 286.
G. F. Still, *Brit. Med. Journ.*, Aug. 19, 1899.

|| Strauss, *Bull. de l'Acad. de Méd.*, 3^{me} série, tome 32, No. 27; and *Brit. Med. Journ.* (Epitome), Aug. 4, 1894.
Noble Jones, *Med. Record*, Aug. 25, 1900.

It is probable, though still unproved, that many infectious diseases obtain their entrance through unhealthy tonsils.* In scarlet fever this is an extremely probable supposition; it is a possible one in measles; it is suspected in some cases of articular rheumatism and typhoid fever; and it is a feasible hypothesis in certain infectious forms of nephritis. The tonsil is the most common site of implantation of diphtheria.

When local resistance is lowered by hot, dusty, ill-ventilated atmospheres, and during epidemics of cerebro-spinal meningitis, the meningococcus is found in the naso-pharynx of healthy adults, who probably convey it to the upper air-passages of their children.†

That chronically enlarged tonsils, or marked adenoids, have lost their defensive powers, and come to resemble a choked filter, is shown by the greater frequency with which adenoid children contract diphtheria and scarlatina, and the severity of throat and ear complications in such cases.

(For the embryology, anatomy, and surgery of the palatine tonsils, cf. p. 363.)

* Emil Mayer, *Journ. of Amer. Med. Assoc.*, Dec. 2, 1899.

† J. S. Fraser and John D. Comrie, *Scot. Med. and Surg. Journ.*, July, 1907, p. 18.

CHAPTER II

METHODS OF EXAMINATION AND GENERAL SYMPTOMS

I. METHODS OF EXAMINATION

Sources of illumination.—A good source of illumination is the first necessity for a satisfactory examination of the upper air-passages. The natural sources at our disposal are sunlight and diffuse daylight. They have the great advantage of not altering the natural colours of the parts examined. Reflected sunlight forms a perfect illuminant, if we are careful not to bring the rays to an exact focus on the mucous membrane, as this might produce a burn. Diffuse daylight is too feeble for the examination of the cavities of the nose and larynx, but it can be used for inspecting the mouth, pharynx, and ear. Direct daylight is particularly valuable for examining suspicious rashes or patches in the mouth and pharynx, and eruptions on the skin.

But some form of artificial light is indispensable. That furnished by an ordinary paraffin-lamp or a gas flame is sufficient for most purposes. The flame should have its flat side towards the observer, and be enclosed in a glass chimney, without a globe or shade. If neither of these lights is available, two or three candles tied together will suffice. For use in the study a paraffin reading-lamp or a gas-standard is equally suitable. The latter is rendered more effective by the adoption of an Argand burner or a Welsbach mantle. The oxy-hydrogen limelight is an excellent illuminant, but it is bulky and expensive. The most convenient light is that given by a 32- or 50-candle-power electric light in a frosted globe, and with the filament waved. The electric light has the further advantage that it is unnecessary to keep it constantly vertical, for, unlike a gas or oil lamp, the electric globe can be rotated so as to direct the pencil of light-rays either upwards or downwards, as well as from side to side. The Nernst electric burner gives increased brilliance. Whichever light is employed, the rays can be concentrated, and rendered more powerful, by enclosing it in a dark chimney with a bull's-eye condenser. The

light must also be provided with some arrangement by which it can be raised and lowered (Fig. 8). For operating, the Clar light is useful (Fig. 9).

In all these methods the light is reflected, but the direct rays of the electric light can be used in a small lamp fixed on the forehead, and fed from an accumulator, or direct from the street current through a suitable resistance. It is better than reflected light in operating on the nose and throat, and the portable accumulator and frontal photophore are convenient for use in the patient's own home (Fig. 10).

The lamp should be placed on a stand or table so that the light is on a level with the patient's ear, and 3 or 4 inches distant from it. In Continental schools it is customary to place the light on the patient's right hand. In this country the lamp is usually placed close to the patient's left ear, i.e. on the observer's right hand. As practitioners will often be called to see patients who are confined to a bed which can only be approached from one side, it is desirable that they should accustom themselves to work equally well with the light on either side, and the frontal mirror over either eye.

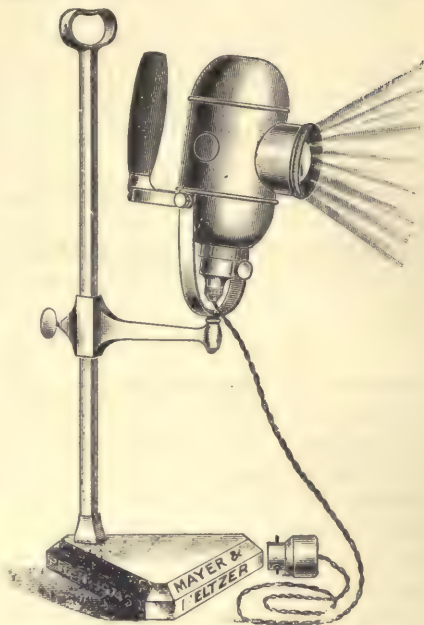


Fig. 8.—Electric standard lamp.

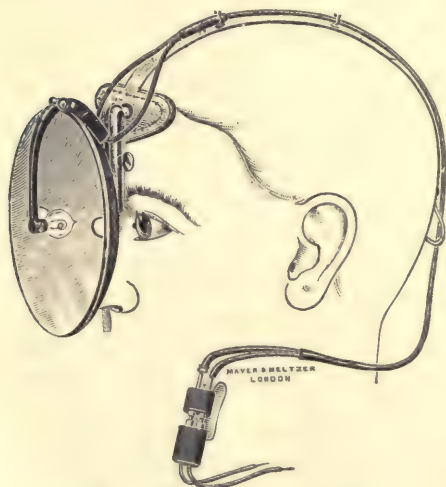


Fig. 9.—Clar search-light.

The laryngoscope.—It is unnecessary to enter into detail on the physics of this instrument, which correspond in principle to those on which Helmholtz founded his discovery of the ophthalmoscope. For regular use we employ a spherical concave mirror, with a diameter of $3\frac{1}{2}$ inches, and a small eyehole at its centre. If the latter is large and oval, it is easier for beginners to manipulate; though a circular opening of $\frac{5}{16}$ inch gives a more perfect focus. The usual focal length is 14 inches, but a mirror which focuses at 8 or 9 inches is much better. In order to leave both hands quite free, the mirror is attached by a ball-and-socket joint to a frontal head-band or a spectacle frame. The latter is chiefly of use for those practitioners who wear glasses, as they can be inserted in the same frame. Otherwise, for general purposes, the head-band is most convenient. The pattern of Stoerk is one of the best. This is made of webbing, and should not be elastic. It is secured with a strap and buckle, and there is a pad on the inner surface that lies over the eye and opposite to the plate bearing the socket in which the ball of the mirror moves. Some prefer a vulcanite head-band, or a metal spring to go over the vertex.

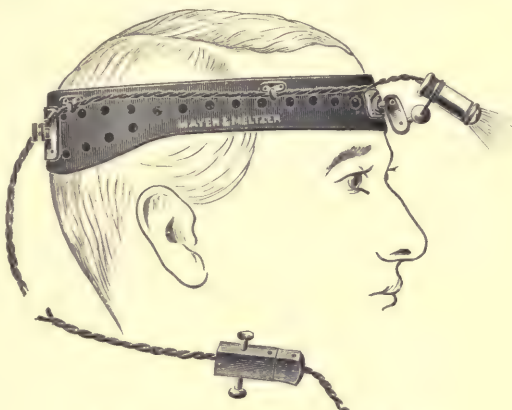


Fig. 10.—Frontal search-light.

Laryngoscopic examination.—The room should be darkened, but, when a good artificial light is available, it is enough if the patient is not placed facing a strong light.

For purposes of manipulation, the patient is seated in a chair without arms to it, and preferably with a rotating seat which can be raised or lowered. The hands rest in the lap, and in many instances may be provided with a handkerchief or spittoon. The patient should not rest one arm on any table or support, as this throws up the corresponding shoulder, and may interfere with movement. He should not lean back in the chair, as then he is apt to slip forward on the seat, and so increase the distance between the surgeon's hands and the site of examination. To secure precision and avoid fatigue, this distance should not be greater than is necessary. The patient, therefore, sits well into the chair, with the whole body craned somewhat

forward from the hip-joints. His head is then freer to receive the different movements which have to be given to it in examination, and the angle it forms with the neck is more suitable for examining the larynx. For nervous patients a head-rest may be employed.

The observer may be seated alongside, or with one knee on each side of the patient's, which are placed together. He may make use of a music-stool, so that he can raise or lower himself according to the requirements of the case. The stool is lower than the patient's chair, so that the observer's eye is on a level with the patient's mouth. In arranging the light, we must remember that the light reflected from a mirror is the more intense the less is the angle of incidence; in other words, the luminous ray and the reflected ray should be as near as possible to the optical axis of the mirror. Hence the lamp is placed as close as convenient to the side of the patient's head, so that the rays reach the mirror almost perpendicularly, though, of course, in the case of a heat-producing lamp, not so close as to be unpleasantly hot. It should be at such a height as to be on a level with the patient's mouth, and, finally, at such a distance as is indicated by the focal length of the mirror employed.

The manipulation of the reflected light is of great importance, and often delays the student more than any other single detail connected with laryngoscopy. It is therefore well worth while to consider what are the chief directions for the beginner:—

1. He should use the mirror on the same side as the lamp, with the opening in it opposite the pupil of the eye.

2. The mirror is manipulated with the hand until it throws the reflected light on the patient's mouth, and this illuminated spot should be visible to the eye behind the mirror. If this is neglected, the student is surprised to find that in a narrow cavity, such as the nose, he is able to illuminate the orifice well, but on introducing the speculum he sees nothing. The explanation is that, although the ray of light was correctly reflected by the mirror, it was the opposite eye which was observing, and, as the nasal cavity is not wide enough to allow of binocular vision, the interior of the nose is invisible to that eye which is not in the same axis as the light rays.

3. Once the light is properly projected towards the patient's mouth, it is not to be thrown in various directions—up to the nose or down to the laryngo-pharynx—by further movements being given to the mirror by the hand, but the direction of the beam of light must be altered by the observer flexing, extending, or rotating his own head in different directions. In fact, the head with its reflector turns in all directions like the movements of an electric search-light.

4. If it is desirable to have a particularly clear and well-illuminated view, we of course approach the eye to the patient, but—contrary to what one would do instinctively—we should move the source of light farther away. This is because the laws of optics teach us that in proportion as a flame is removed from a concave mirror, so its reflected image comes nearer, while becoming smaller and more distinct. On the other hand, if we desire to illuminate a larger surface, we must be content to have a feebler illumination, and we do this by approaching the lamp to the reflecting mirror, but increasing the distance between the latter and the patient. The former method is chiefly of service in inspecting the larynx, the latter for examining the mouth and pharynx.

General examination.—Before starting the technical examination of a patient, certain indications can be obtained from general observation. Thus, we may notice the exterior of the nose and configuration of the face; the appearance of the eyes and pupils; the presence of mouth-breathing and inactive *alæ nasi*; the presence of any offensive odour from the breath; the character of the voice; dyspnœa; cough; stridor (inspiratory or expiratory); pain on swallowing saliva; stiffness in movements of the neck; glands or swellings in the neck; or evidence of *anæmia*, wasting, or *cachexia*.

THE NOSE

The *alæ nasi* should be observed to see if they are well developed and mobile, or thickened and paretic. Before introducing a speculum, the vestibule of the nose, or *introitus narium*, is examined by placing the second and third fingers* on the patient's forehead, while the tip of the nose is tilted upwards with the thumb of the same hand (Fig. 70, p. 120). By this method an important part can be viewed which would otherwise be concealed by the blades of the speculum.

Testing nasal stenosis.—The patency of the nasal chambers is frequently tested by inviting the patient to inspire through them. This is comparatively useless, except in cases where obstruction is almost complete; for, by voluntary effort, a current of air can be drawn through an obstructed channel which, in the absence of an effort of the will, would be quite inadequate for ordinary respiration. A fairer test is to notice how much air can be expired down each nostril, the mouth remaining closed. In testing one nostril the other one should be closed, not by compressing the *ala nasi* on that side, as this frequently tilts the septum over so as to enlarge the opposite side, but by placing the pulp of the thumb directly over the orifice of the nose. If the patient then breathes quietly through the open side, an approximate idea can be formed as to its patency. If the expired air is received on a glass mirror, some indication will be given by the area of the condensed moisture as to the width of the nasal thoroughfare, while the duration of the time it takes to evaporate indicates the volume of air.* *Vulcanite* with a medium polish gives a very reliable and faithful image. By placing the plate horizontally on the upper lip, half an inch from the nostrils, and giving one short and steady expiration, a well-defined steam impression results which, on evaporating, affords reliable evidence of the actual and relative patency of the nostrils.† The image may be temporarily fixed, or rendered more conspicuous for demonstration purposes, by lightly powdering it with calcined

* A. Courtade, *Arch. Internat. de Laryngol.*, xv., 1902, p. 17.

R. Itié, *Ann. des Mal. de l'Oreille*, xxxv., ii., 1909, No. 11, p. 553.

† Wyatt Wingrave, *Lancet*, Jan. 26, 1907.

magnesia or fine starch.* Sleeping children can be tested by a frayed-out piece of cotton-wool held first over one and then over the other nostril. The degree of stenosis can be measured by means of a rhinomanometer.†

Nasal specula.—Of the several nasal specula used in viewing the interior of the nose, the beginner is advised to accustom himself to that of Thudichum, as being very suitable for both examination and treatment (Fig. 11). This instrument is introduced into the vestibule of the nose with the blades closed, first in an upward direction, when they are allowed to expand slightly and then given a tilting movement so as to bring

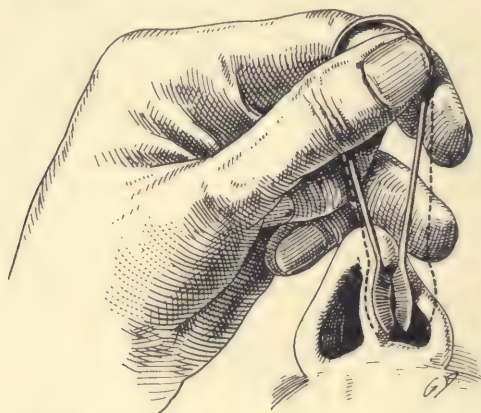


Fig. 11.—Method of using a nasal speculum (Thudichum's).

The spring of the instrument is compressed between the first and second fingers of the left hand. It is then introduced, while thus closed, into the nostril, and gently allowed to expand until it occupies the position indicated by the dotted lines. Note that the expansion is principally directed towards the ala nasi.

their axis into the same straight line with the different regions of the nasal chamber (Figs. 12 and 13). The observer's third and fourth fingers resting on the nose serve to move the patient's head in different directions. It must be remembered that the nasal speculum is used as much for altering the axis of the nose in the manner indicated as for dilating the orifice. In fact, its powers in the latter direction are slight and limited.

Anterior rhinoscopy.—Beginners almost invariably cause pain through introducing the speculum too far, or too obliquely, or allowing the blades to open too brusquely or too widely. The spring should

* Small sheets of vulcanite, with a suitable surface and of a convenient size for the purpose, may be obtained at the Medical Supply Association, 167-73, Gray's Inn Road, London.

† Harold A. Kisch, *Brit. Med. Journ.*, April 4, 1914.

always be kept under control with the first and second fingers of the left hand, as indicated, and should never be allowed to open to its

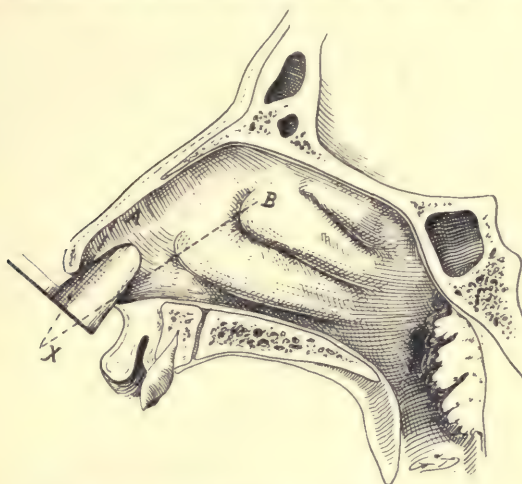


Fig. 12.—Anterior rhinoscopy : Manipulation of the nasal speculum.

The blades of the instrument are first directed inwards and upwards. This gives a view of the area between the points *A* and *B*.

maximum until the surgeon is well acquainted with its strength. Many kinds of specula are provided with too resilient a spring. The

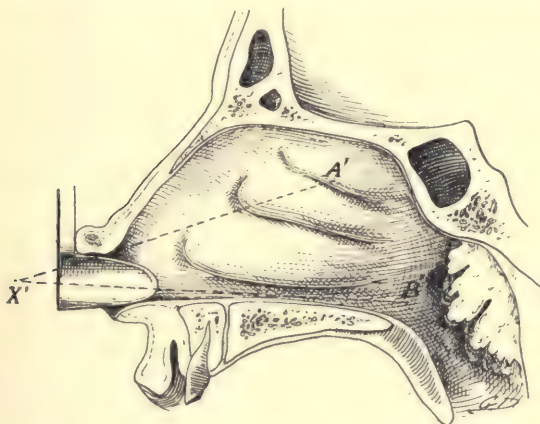


Fig. 13.—Anterior rhinoscopy : Manipulation of the nasal speculum.

After being inserted, as shown in Figs. 11 and 12, the instrument is rotated, raising the extremity of the nose, and bringing into view the area between the points *A'* and *B'*. In this position adenoid growths or other conditions of the naso-pharynx may be observed by anterior rhinoscopy.

modification of Lennox Browne's avoids this, and is a useful form. In small children it is generally impossible to make use of a speculum, and sometimes a vulcanite ear-speculum will be found of service. A favourite speculum in France is the duck-bill form of Duplay. Although it requires both hands to introduce it, it is not uncomfortable, and it serves excellently for purposes of examination. In the German and Austrian clinics the student will find that the bivalve form known as Chiari's, Hartmann's, etc., is almost universally used. Several attempts have been made to design self-retaining nasal specula. One of the best is that of Cresswell Baber. It is seldom, however, that there is any need for one.

The nasal probe.—Before proceeding with the inspection of the interior of the nose we should be provided with a nasal probe, without which no examination is complete. A good form is made of plated copper with a bulbous extremity. At a distance of $4\frac{1}{2}$ inches from the tip it is bent at an obtuse angle, and it ends in an expanded plate by which it can be easily and firmly held between the thumb and first two fingers. A similar instru-



Fig. 14.—Nasal probe.

ment, spirally roughened at the point, serves as a cotton-carrier. The probe should be pliable enough to take any form which may be given to it, but firm enough to retain its shape inside the nasal cavity. (Fig. 14.)

The nasal probe has several uses :—

1. It detects the thickness and character of the mucous lining, whether collapsed, atrophied, congested, or hypertrophic.
2. It can be passed into parts of the nasal labyrinth beyond our sight, and so defines the extent of tumours. It distinguishes between mere hyperæmia, hypertrophy, and polypus.
3. It raises masses of secretion or portions of hypertrophy or growth, thus enabling the eye to penetrate farther.
4. With the limitation of monocular vision which is inevitable in the narrow passage of the nose, it assists in measuring perspective.
5. It serves for the detection and examination of foreign bodies, rhinoliths, caries, sequestra, and perforations far back in the septum.
6. It detects hyperæsthetic areas in the nose, and controls the efficiency of local anæsthesia.
7. It is useful in revealing the site of a latent epistaxis (p. 113).
8. It serves for sounding the nasal accessory sinuses.

Normal appearances of the interior of the nose.—It is desirable, as in the examination of other parts of the upper air-tract, to follow a routine order in exploring the interior of the nasal cavities. The chin should be depressed a little so as to bring the sloping floor of the nose to the horizontal (Fig. 13). When the speculum is introduced

as directed, and the light properly reflected, the cartilaginous mucous membrane is seen on the inner side; the floor is noticed to be on a decidedly lower plane than the vestibule; and on the outer side the smooth, round, red mass of the inferior turbinal is the most prominent feature. Above this area the anterior extremity of the middle turbinal comes into view. The further extent of view possible will depend on the state of engorgement of the inferior turbinal. The superior turbinal is very rarely visible by anterior rhinoscopy. In cases of turbinal collapse or atrophy, or after the constricting effect of cocaine, the eye can follow the inferior meatus until it opens into the cavum

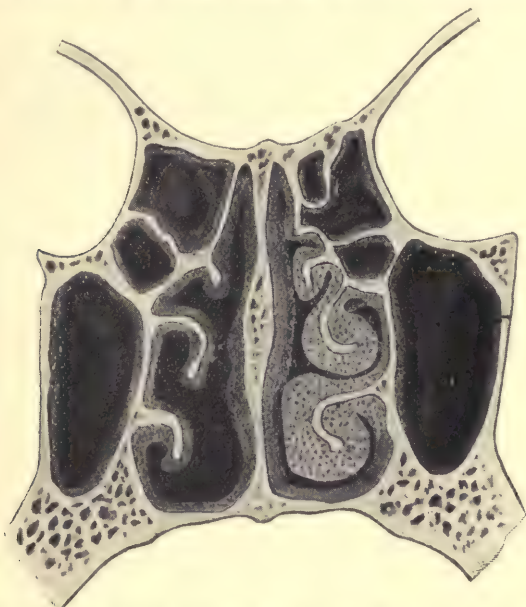


Fig. 15.—Frontal section through the nasal cavities.

On one side the erectile tissue of the turbinals has been injected, and the nasal air-way is proportionately narrowed. On the opposite side the turbinals are collapsed, and the nasal cavity is enlarged. These two conditions are analogous to what occurs in congestion and in atrophy of the nasal mucosa. (After Hermann.)

pharyngeum and the posterior pharyngeal wall becomes visible. If the patient is told to say *E* or *K*, or even swallows a little of his saliva, the soft palate will be seen to rise above the floor of the nose, and the posterior fold of the Eustachian tube is seen to move inwards towards the middle line. It is desirable to acquire the practice of being able to see through to the cavum, as the procedure is very valuable in certain cases, especially in children, where posterior rhinoscopy does not always succeed.

The patient's head should now be slightly raised, to about an angle of 30° , when the parts included between *A* and *B* in Fig. 12 will be seen. More of the septum can be examined on the inner side, its tubercle coming more prominently into view; to the outer side is the upper surface of the inferior turbinal sloping outwards, and

above it is the main mass of the middle turbinal, ending anteriorly in the operculum. Between the middle turbinal and the septum is the olfactory cleft, while below and external to it is the middle meatus. The latter is bounded externally by the lateral wall of the nose, sometimes showing a fold (the lateral fold) over the uncinate process. This, if hypertrophied, might be mistaken for the middle turbinal. When the middle turbinal is not very prominent there may be seen in the depths of this region the upper concave margin of the posterior choana. Above this is the anterior wall of the sphenoidal sinus, but the opening of the latter is never visible in a condition of health, except by the aid of special measures (p. 23).

When the head is inclined further backwards, to an angle of about 60° , only the end of the anterior free extremity of the middle turbinal is visible, frequently in apposition with the septum. (Fig. 12.) To the outer side are the agger nasi and the atrium, and above is the

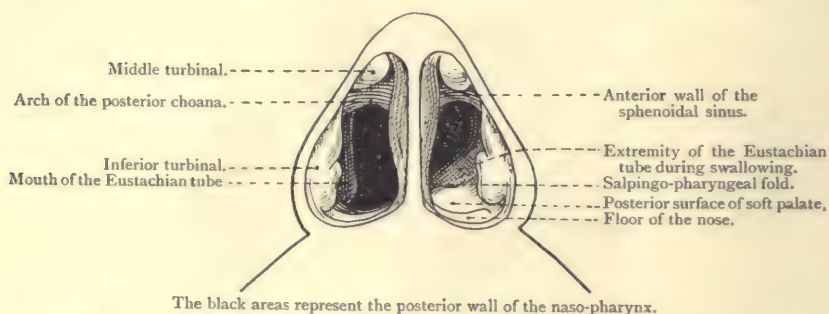


Fig. 16.—Inspection of the nose after the use of cocaine.

Semi-diagrammatic drawing of the various areas which may be rendered visible in the nose after the inferior turbinates have been well retracted by the use of cocaine. On the right side the parts are represented while at rest, and on the left side the appearances during swallowing or speaking. This view may also be obtained in atrophic rhinitis.

roof of the nose, formed by the nasal bones and lateral cartilages, sloping forwards into the anterior cul-de-sac.

The colour of the mucous membrane is pinkish, varying from a faint rose to a deep red. In narrow noses, and when there is any suspicion of pathological conditions, the examination cannot be said to be completed until the soft parts have been retracted by the use of cocaine (p. 71). (Figs. 15 and 16.)

The secretion in the normal nose is practically invisible, consisting of a uniform coating of clear mucus. There should be no accumulation of mucus or crusts except in and near the vestibules, where most of the dust is arrested. A thin coating of dust may be met with on the anterior part of the septum and the lower border of the middle turbinal. Any which penetrates more deeply is entangled in mucus and swept out by the ciliated epithelium. Secretion or membrane in the nose may require bacterioscopic examination or chemical analysis. Should there be any collection of secretion in the nose, it is better to inspect it before the nose is cleared (see p. 56). The simplest method of removing it is to ask the patient to blow his nose; or any

crusts may be lifted out with nasal dressing forceps (Fig. 17), or else sprayed or syringed out with a suitable lotion (p. 56).

Median and deep rhinoscopy.—The olfactory cleft and middle meatus can be brought into view by means of Killian's long nasal

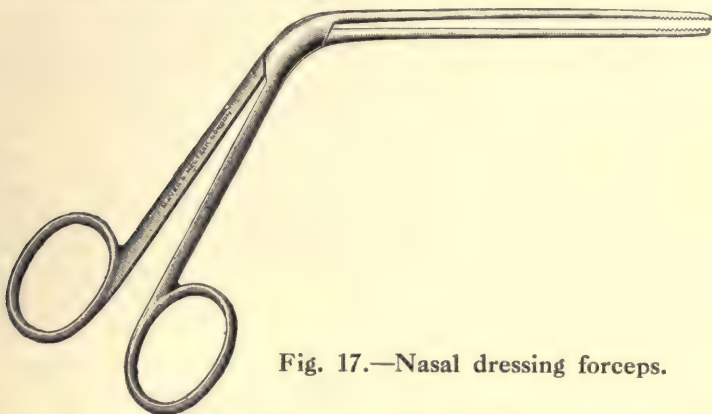


Fig. 17.—Nasal dressing forceps.

speculum (Fig. 18). The parts must first be well cocainized, and the closed blades are then insinuated between the septum and the middle turbinal. They are dilated with moderate pressure, and the instrument then pushed gently forward towards the anterior surface of the sphenoid. This is possible as the elasticity of the septum allows of its being displaced inwards, while the fragile lamella of the middle turbinal can be bent outwards. By advancing the blades with care and patience, the olfactory cleft can be explored up to the lamina cribrosa, and the opening of the sphenoidal sinus can be inspected and the cavity sounded or washed out. A shorter instrument can, in a similar way, be introduced between the middle turbinal and the outer nasal wall, so as to view the hiatus semilunaris, the processus uncinatus, the bulla ethmoidalis, the openings of the ethmoidal cells, and the entrance to the fronto-nasal canal.*

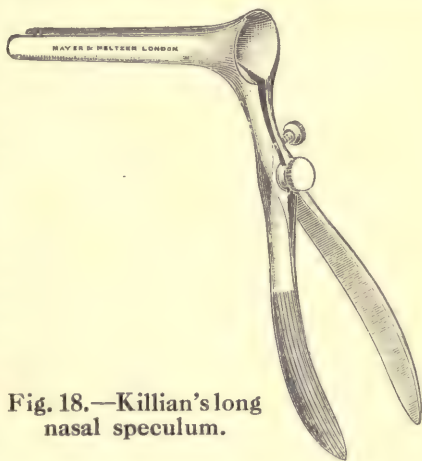


Fig. 18.—Killian's long nasal speculum.

Digital examination of the nose.

—When a patient is under a general anæsthetic for operation, the little finger can be introduced into the nostril as far as the ethmoid region. The first finger can also be passed

* *Munch. med. Woch.*, 1896, No. 33.

through the mouth and naso-pharynx to the posterior choana, where it assists in locating and steadying growths as well as for guiding instruments. The use of transillumination and the Röntgen rays will be dealt with in the chapters on Diseases of the Nasal Accessory Sinuses (p. 238).

The inspection of the nose can only be completed by the employment of posterior rhinoscopy (p. 28), but, as this requires the use of a tongue-depressor, and as our inspection must first traverse the mouth and pharynx, we will follow the definite order recommended clinically and describe these latter regions first.

THE MOUTH AND PHARYNX

The interior of the mouth is first scrutinized before introducing any instrument, and the lips, gums, cheeks, and tongue are examined for ulcers, fissures, etc. The condition of the teeth is observed, and the floor of the mouth looked to for ranula or



Fig. 19.—Lack's tongue-depressor.

any thickenings. This is particularly necessary if there is any difficulty in protruding the tongue, or any complaint of dysphagia. The tongue should be observed, the character of the fur on it being noted, and also the presence of any mucous patches, fissures, ulcerations, or thickenings. In many instances the sides require careful inspection, particularly far back where they are joined by the anterior pillars of the fauces.

A tongue-depressor (*a*) should be curved, so that the handle may fall below the level of the patient's chin and not interfere with inspection or examination; (*b*) should be smooth, so as not to injure or irritate soft parts or leave corners for the concealment of septic matter; (*c*) should have a comfortable handle, since much of the success of using the instrument depends on a firm but easy grasp; and (*d*) should be made entirely of metal, so that it can be thoroughly sterilized. The instrument known as Fraenkel's answers to all these requirements (Fig. 22), and Lack's tongue-depressor is very serviceable for children (Fig. 19). Reflex movements are excited less if an instrument is used which only keeps the tongue in place along its centre, and allows its intrinsic movements to take place on each side. In subjects where the whole tongue is extremely mobile and restless the depressor of Türck will be found satisfactory (Fig. 20).

In small children who are nervous or not accustomed to "showing their throats," or too small to be instructed, it is a much wiser plan not to use any instrument at all, as the very sight of one will often cause terror; but, having coaxed the little patient to open his mouth, the purified left forefinger is quietly slipped over the side teeth on to the dorsum of the tongue, whose movements it controls excellently, while the thumb of the same hand is hitched under the lower jaw, and thus, without alarming either patient or parent by a display of force, the mouth is kept well in the light. The finger should be carefully disinfected at once. (Fig. 21.)

Pharyngoscopy.—In order not to fatigue the patient unnecessarily, the light is reflected on to the patient's lips before asking him to open his mouth, so that it can afterwards be quickly focused on the parts to be observed. The mouth being then opened, it will be seen that the tongue as it lies in the floor of the mouth is arched from before backwards. If the depressor is placed in front of the highest part of this arch, only the anterior

portion will be depressed, while the region behind will rise and obscure the view more than if no depressor at all were employed. On the other hand, if the point of the depressor passes much beyond the highest part of this arch, it may slip backwards, or the tongue may be displaced forwards, and gagging be produced (Fig. 22). The depressor should not be slid over the tongue; it is gently but firmly placed flat on the surface, with the tip a little beyond the highest point of the arch. If the tongue is arched, the patient should be asked to say *Ah*, and as it recedes in pronouncing this vowel the depressor is placed in position. Once there, the tongue must not be pushed or pulled, but is



Fig. 20.—Türk's tongue-depressor.

gently pressed not only downwards but a little forwards, so as to increase the space between its posterior (vertical) surface and the back of the throat (compare Figs. 31 and 32). If children cannot be coaxed to open their mouths, the nose must be pinched until they gasp for breath, when the spatula is slipped in quickly behind the posterior molars.

With the tongue-depressor in position, the roof of the mouth, the hard and soft palate, the fauces, and the buccal pharynx are brought into view. The hard palate should be inspected



Fig. 21.—Use of the left forefinger as a tongue-depressor in children.

close up to the roots of the incisor teeth. The movements of the soft palate are observed, and any paresis noted in reference to the central raphe when the vowel *Ah* is pronounced. The uvula, the tonsils, and both the posterior and lateral pharyngeal walls are inspected, while we note the presence of mucus, mucopus, crusts, granulations, atrophy, ulceration, membrane, or new growths. Inspection of the lateral pharyngeal walls and tonsils is often not completed until the patient gags, or retches, and so projects the tonsils from the faucial recesses. As it often starts an irritability of the pharynx, it is deferred until the examination of the naso-pharynx and larynx has been completed.

Use of a tongue-depressor.—The following points should be borne in mind :—

1. The mouth is held comfortably open, not stretched to its widest extent.
2. The tongue is not protruded, but should rest within the mouth. It is better not to tell the patient to keep the tip of the tongue within

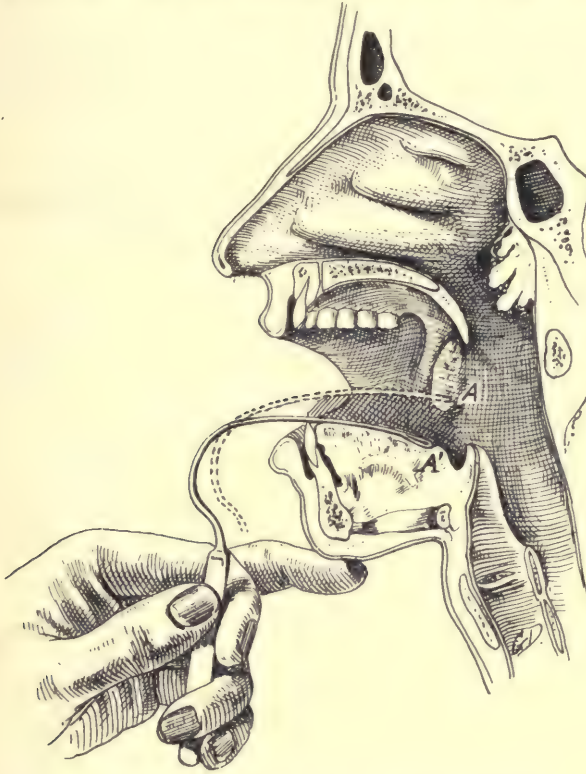


Fig. 22.—Use of the tongue-depressor.

The spatula is held in the left hand, the second finger helping to support and steady the patient's chin. The depressor is introduced along the tongue, as shown in the dotted line. It is then gently pressed downwards and forwards, so that the tip moves from *A* to *A'*, holding the tongue downwards and forwards.

the teeth, as he will then probably press the tip strongly against the lower incisors while the rest of the organ rears like a restive horse.

3. The depressor should always be kept in the middle line.
4. The tongue must not be forced down with the end of the depressor ; the flat surface of the instrument is used as evenly as possible, and the tongue should be rather restrained than pushed.
5. The depressor should not be used brusquely, or hesitatingly, and, though handled firmly, no force should ever be employed.

6. If asked to "go on breathing," the patient is apt to draw a deep inspiration and then hold it. He is therefore encouraged to continue breathing in and out quietly through the mouth.

7. Care should be taken that the depressor does not compress the tip of the tongue against the lower teeth, although it can sometimes be balanced on the latter so that, by a lever action, the tongue is drawn downwards and forwards (Fig. 22).

THE NASO-PHARYNX

The posterior-rhinoscopic mirror.—The mirror employed for examining the postnasal space is simply a small-sized laryngeal



Fig. 23.—Postnasal mirror.

mirror on a suitable handle. I use as large a size as can be manipulated, depending on the natural size of the faucial isthmus and the presence of tonsils, but generally it will be found that one with a diameter of 1 to 2 centimetres will suit most cases. The angle at which the mirror fits the shank is less than that of the laryngeal mirrors, and varies from 110° to 125° (Fig. 23).

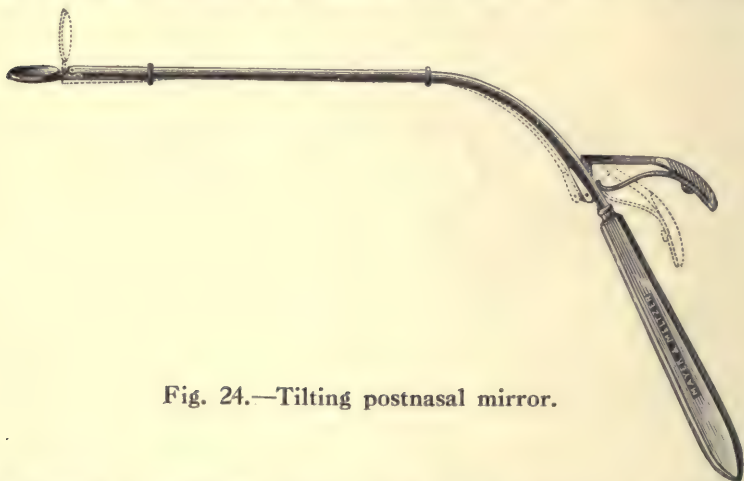


Fig. 24.—Tilting postnasal mirror.

Fraenkel's or Michel's mirror, which can be placed at different angles, may be required for obtaining a satisfactory view of the choanæ, but for ordinary purposes it is unnecessary. (Fig. 24.)

Posterior rhinoscopy.—The patient being seated as already indicated, and the lamp placed on a level with the ear and a

little behind it, the head is held a little forwards, and the light is reflected on to the mouth of the patient at such a focal distance that the light does not overlap the lips. As soon as the mouth is opened it will be found that the light is properly focused for examination. If the patient is asked to open his mouth before the reflected light is arranged, some time may be taken up in arranging the latter, and the patient is tired, or annoyed at being kept in suspense with his mouth agape. In order to be successful the preparations should not be made in such a manner as to alarm the patient. He is therefore encouraged to allow himself to remain passive and inert, and not to stiffen up the muscles of his throat, as he is often inclined to do. Also, instead of holding his breath

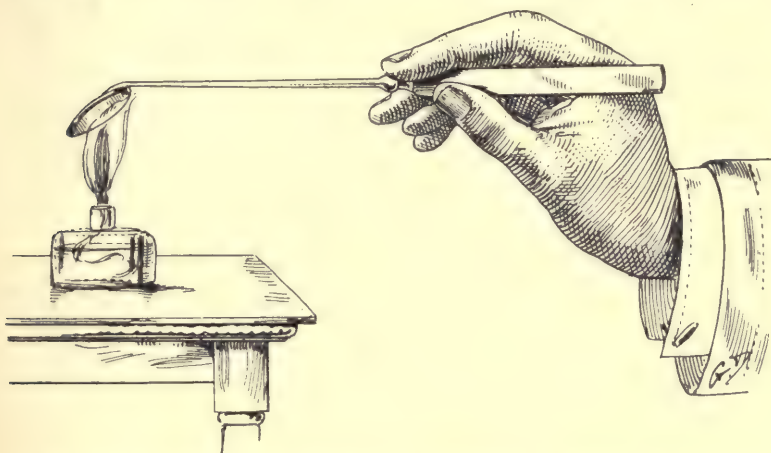


Fig. 25.—Method of holding and warming a laryngeal mirror.

Note that it is the glass surface, not the metal back of the mirror, which is held in the flame.

he should be asked to continue breathing without pause, through his nose if possible, and in a natural manner.

The post-rhinoscopic mirror is warmed by passing the glass surface backwards and forwards over the chimney of a lamp or the flame of a spirit-lamp (Fig. 25). A mist first forms on its surface, due to the condensation on the cold glass of the moisture in the products of combustion of the flame. As this passes off, the glass will be found sufficiently warmed not to condense the moisture of the patient's breath. It should be tested, to see that it is not too hot, by placing the metallic surface on the back of the examiner's left hand. If a sterilizer is at hand, the mirror can be warmed by dipping it in hot water. The deposit of moisture may also

be avoided by smearing the mirror with soap, or dipping it in a $\frac{1}{2}$ per cent. solution of lysoform or lysol, and then polishing it with a tongue-cloth. The metallic back of the mirror should not be heated; being a good conductor of heat this would tend to destroy the silvering of the mirror, the expansion of the metal might injure the soldering, and the glass would take longer to heat. It may be necessary to explain to nervous patients, meantime, the object of this proceeding, as otherwise they might fear that it was the first step of a cauterization. The patient now opens his mouth, the light is directed so as to focus on the soft palate, the tongue-depressor is introduced as directed, and the warmed mirror is held in the right hand like a pen and introduced into the mouth with the glass surface uppermost. It is passed backwards over the tongue, and then insinuated behind the uvula, until it is brought into position in the middle line with the reflecting surface directed upwards and forwards (Fig. 27). During this transit it should not touch the tongue, fauces, posterior pharyngeal wall, or uvula. The soft palate may draw up at the moment of passing the mirror through the fauces. By waiting a moment it will generally fall again, or this may be brought about by asking the patient to say *Ong*.

The following are the chief faults of beginners:—

1. They do not illuminate correctly. A strong light is required for the proceeding, as it has to be twice reflected, once from the frontal mirror and once from the throat mirror. The quantity of light is also diminished as the size of the latter is reduced. There is all the more reason for focusing it correctly and evenly.

2. They irritate the patient and produce reflex movements, by improper use of the tongue-depressor (p. 27), or by touching sensitive parts with the throat mirror.

3. They prolong the examination unduly. As the patient is unable to swallow his saliva with the mouth open, it collects and produces reflex movements. Besides, the mouth remains closed by atmospheric pressure only, without muscular action, and the keeping it open produces muscular fatigue.*

4. The mirror is not introduced far enough, and only gives an image of the posterior surface of the uvula.

5. The mirror is not tilted and rotated properly, so as to give a consecutive picture of the various parts of the postnasal space.

With patience and tact on the part of the observer, rhinoscopy rarely fails, and in more than 90 per cent. of cases a satisfactory view can be obtained. It must always be remembered that force is of no avail, and that if gentleness does not succeed, roughness is sure to fail. The patient must neither be worried nor fatigued, and if a satisfactory view appears to be impossible at the first visit it is wiser to encourage him and postpone further attempts to a future day, when with increased confidence they will doubtless be successful.

* Donders and Mezger, *Pflüger's Arch. f. der Ges. Physiol.*, 1875, S. 89.

If still, in spite of every effort, we do not succeed and it is very important to obtain a view, we may try the effects of a little cocaine in checking the irritability, by either painting the dorsum of the tongue and the soft palate with a little 5 per cent. solution, or spraying the same parts with a 2 per cent. solution. If this fails (and we cannot employ it in children on account of its toxic effects), we must have recourse to digital examination (p. 34). I have seldom found the self-retaining palate hooks of any service. Where they can be tolerated they are not required, and in the cases where we most need them they cannot be endured.

The difficulties met with may be due to a restive tongue, enlarged tonsils, a prominent anterior arch to the atlas, strings

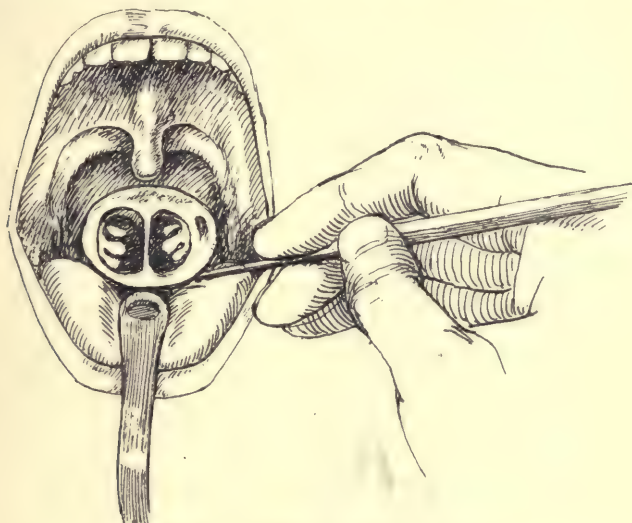


Fig. 26.—Posterior rhinoscopy.

of saliva or mucus, or a sensitive soft palate. The trouble with the tongue and soft palate is specially noticeable in those who suffer from indigestion, in alcoholic subjects and excessive smokers.

Image of postnasal space.—We have to remember that the postnasal cavity is a dome-shaped space, and, as the area which can be reflected at one time in the mirror is limited, we can only obtain a panoramic view by moving the glass in various directions. These movements should be imparted to the mirror in two planes. By rotating it around its centre in a vertical antero-posterior plane, the parts of the posterior nares, roof, and posterior wall can be viewed (Fig. 26). Then by rotating it to the right or left in a horizontal plane the lateral walls are reflected. By a combination of these movements a composite picture is made up.

In order to omit nothing, it is well to follow a definite order, examining—

1. The anterior boundaries of the space, containing the back of the soft palate, the posterior choanæ, and their relations.
2. The vault of the cavum and its posterior wall.
3. The sides of the cavity.

In viewing the pictures of the posterior choanæ in the mirror the image is not reversed; the left choana is reflected on the left side of the mirror and the right choana on the right side. But it gives a considerably foreshortened picture, owing to the inclination of the mirror (Fig. 27). The mirror should therefore be held with its reflecting

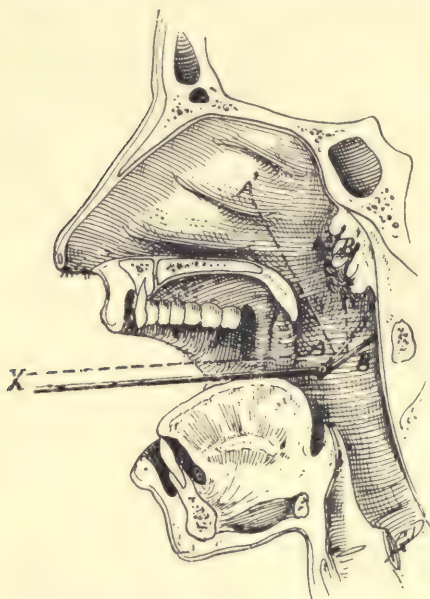


Fig. 27.—Manipulation of the postnasal mirror.

When the mirror is in the position indicated by *A* it gives a picture of the posterior choanæ and the region in the direction of the line *A—A'*. This might fail to bring to the observer's eye (at *X*) the presence of adenoid growths (*B*), or other conditions of the nasopharynx. To bring these into view the mirror must be moved to *B*. This is effected by raising the handle (*X—B*) or by using a tilting mirror (Fig. 24).

surface facing forwards and only slightly upwards (Fig. 27, *A—A'*). We thus view the back of the soft palate—a favourite situation for gum-mata—and notice any collection of pus. Above this is the septum. This is almost invariably found to be strictly in the middle line, in striking distinction to what is met with in the anterior part of the septum. On each side is the posterior opening of the nose, with the extremities of the inferior, middle, and superior turbinals. As the convexity of the soft palate tends to conceal the inferior turbinal, it is sometimes not so prominent as the middle. Tilting the mirror so as to face a little more upwards (Fig. 27, *B—B'*), the vault of the cavity comes into view. It is smooth, or sometimes shows traces of Luschka's tonsil, either in the form of a slightly raised velvety surface, or in the shape of ridges and intervening sulci. One central sulcus may be larger and deeper than the others, and is termed the recessus medius (see Figs. 171 and 172, p. 317). If the reflecting

surface of the mirror is sloped until it looks almost vertically upwards, the posterior wall can be inspected down to where it joins the buccal pharynx and becomes open to direct inspection. It should be uniformly smooth and even, but it may show remains of adenoid hypertrophy, and the prominence of the body of the atlas is sometimes noticeable. Now turning the mirror by moving the hand

slightly to one side or the other, the lateral walls of the cavity are brought into view. External to the choana, and separated from it by the depression of the posterior nasal groove (Fig. 28), is the recess caused by the opening of the Eustachian tube. It is recognized by its triangular form and by the yellow-white tint given to its mucous membrane by the subjacent cartilage. The posterior lip is the most prominent, and forms the Eustachian cushion, from which descends the salpingo-pharyngeal fold. Behind this is a well-marked depression, the fossa of Rosenmüller. Across it, from the cushion of the Eustachian tube to the posterior wall, sometimes stretch small bands of mucous membrane. The colour of the mucous membrane lining this region is generally dark red, of a deeper shade than that lining the buccal pharynx. But the orifices of the Eustachian tubes present a more or less yellow tint, while the posterior margin of the septum is generally so pale as to appear almost white. The posterior extremities of the turbinals are generally of a dull grey, and very different from their anterior extremities.

Another method of directly inspecting this region without the intervention of a mirror has been suggested. It was first proposed by Keen* as an operating position, and has been further studied by Katzenstein† for purposes of examination. The patient lies on his back with the head hanging over the end of a sofa. The mouth being opened, the tongue is drawn forwards as for laryngoscopy. With a blunt hook the soft palate can be gently and gradually drawn forwards so as to

reveal directly the roof and posterior wall of the space—in fact, all except the posterior choanæ. Keen, in addition, places the patient in the Trendelenburg position, and states that adenoids can then be removed “with the aid of sight as plainly as if they were on the face.” He recommends the position for several operations on the upper air-passages, both for its convenience and because there is no danger from the escape of blood and mucus.

The pharyngoscope.—When children cannot be trained to show the postnasal space, and in bedside examination when patients cannot lend themselves readily to examination, this region can sometimes be viewed by the pharyngoscope (*see* p. 51).



Fig. 28.—Posterior rhinoscopic view of the choanæ and roof of the naso-pharynx.

Shows the posterior surface of the soft palate, the roof of the naso-pharynx occupied by adenoid growths, and a mulberry hypertrophy of the posterior end of the right inferior turbinal. The posterior extremities of the turbinals are seen, and the orifices of the Eustachian tubes.

* *Annals of Surg.*, July, 1897.

† *Arch. f. Laryngol.*, Bd. v., S. 283.

The naso-pharyngoscope.—The instruments of Gyergyai or Yankauer, although not particularly useful in children, might help those practitioners whose technical skill is not kept in practice by daily use.* (Fig. 29.)

Digital examination of the naso-pharynx.—This may be required for the detection of adenoid growths in children in whom posterior rhinoscopy does not succeed, as well as for exploring foreign bodies, thickenings, tumours, and abscesses at any age. The patient is seated, and, if young, his hands may be held by

an assistant. Or he may be swaddled in a large towel and held by a nurse (Fig. 38). The forefinger of the right hand, carefully purified beforehand, is inserted between the teeth on the right side (Fig. 30), passed downwards towards the base of the tongue, and then rapidly curved upwards behind the soft palate. The front of the palate should not be touched, as otherwise it is rapidly retracted and might be bruised. Once the forefinger is in the postnasal space, the walls of the cavity are rapidly explored. If no adenoid or other growth is present, the roof and posterior wall are smooth and regular; on the anterior boundary are felt the sharp edge of the septum, the openings of the choanæ, and the extremities of the inferior and middle turbinals; while on the

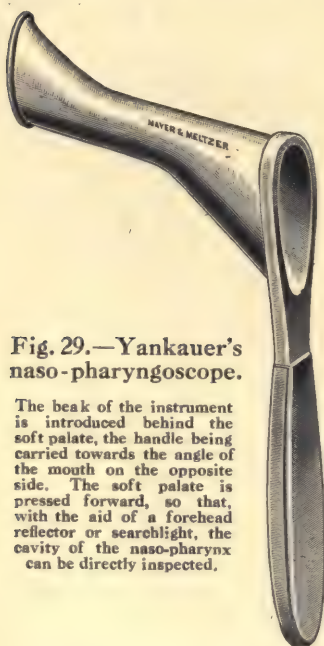


Fig. 29.—Yankauer's naso-pharyngoscope.

The beak of the instrument is introduced behind the soft palate, the handle being carried towards the angle of the mouth on the opposite side. The soft palate is pressed forward, so that, with the aid of a forehead reflector or searchlight, the cavity of the naso-pharynx can be directly inspected.

lateral walls the cartilaginous orifices of the Eustachian tubes are distinct. The examination can be completed in a few seconds. It is well to tell patients that it will be disagreeable but is soon over. It should, of course, be deferred till all other examinations have been completed.

The **sense of smell** is investigated by holding various volatile substances (lavender, peppermint, cloves, or camphor) of different strengths to the nostrils, and noting how they are perceived by the patient. Irritating vapours, such as ammonia, or powders, such as snuff, act mechanically on the branches of

* S. Yankauer, *Laryngoscope*, March, 1911.

the fifth nerve, and must not be confounded with bodies which stimulate only the olfactory nerve. For more accurate examination the olfactometer of Zwaardemaker may be employed.* Loss of taste is frequently complained of in nasal affections, as all delicate savours are really perceived by the olfactory nerve. The patient may suffer from an offensive smell from the nose (cacosmia), though others cannot detect it. On the other hand,



Fig. 30.—Digital examination of the naso-pharynx.

The patient is seated and a towel placed over the head. The surgeon stands on the child's right hand, holding the left end of the towel in his left hand, while he supports the head firmly against his armpit. This prevents the patient from rising from the chair, and so getting out of position. The patient opens the mouth, and the examiner uses his left forefinger to push the cheek inwards, between the upper and lower jaw on that side. This prevents the patient from closing the mouth, and avoids the risk of the examining finger being bitten.

if the olfactory nerve is damaged, as in *ozæna*, the patient may be unconscious of the fearful odour he spreads around him. Sometimes, as in syphilitic necrosis, the stench is only too perceptible both to the patient and to those about him.

THE LARYNGO-PHARYNX AND LARYNX

The protrusion of the tongue in a child is often sufficient to reveal the tip of the epiglottis. This is due to the fact that in

* *Arch. f. Laryngol.*, Bd. iii., S. 368.

early life the larynx is at a much higher level than in the adult, so that while in the latter the tip of the epiglottis is on a plane with the lower border of the third cervical vertebra, in a child of six years it is level with the axis, and in an infant of three months it reaches the lower border of the atlas. The same anatomical disposition explains why in early life we are often able to obtain a fairly satisfactory direct inspection of the region

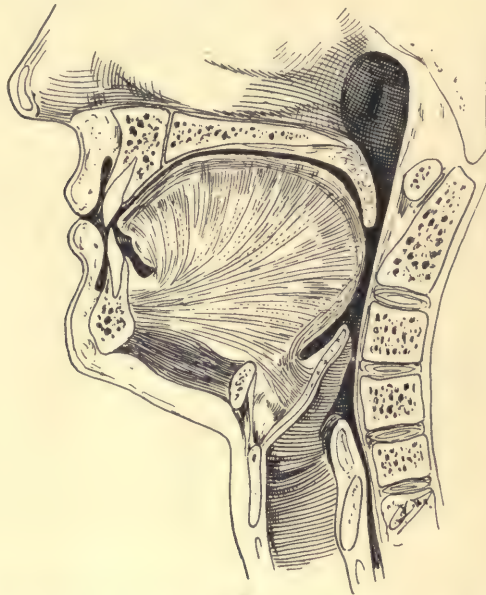


Fig. 31.—Sagittal section of the mouth, pharynx, and larynx.

Shows how the tongue, when the lips are closed, comes in contact with the palate, so that the mouth remains closed chiefly through atmospheric pressure. The epiglottis is almost in contact with the posterior pharyngeal wall overhanging the glottis. The line of entry into the larynx is, therefore, in this condition, from above and behind, downwards and forwards. (Cf. Fig. 32.)

(After Merkel.)

lying in front of the epiglottis, i.e. the base of the tongue. In some adults any projection above the surface in this neighbourhood will come into view either on depressing the tongue or on making traction on the tip of that organ. But, in the majority of cases, the base of the tongue is almost vertical and looks directly backwards; and a reference to Fig. 31 will show that it is of considerable depth, so that this region—and, of course, the whole of the interior of the larynx—is entirely concealed from direct inspection. It was only the invention of

the laryngoscope by Garcia in 1855 which rendered this region visible.*

The same arrangements are required for the examination of the base of the tongue, the pharyngo-larynx, and the larynx, and the inspection of these regions is carried out in the one manœuvre. The light is disposed as already described (p. 13), and the observer provides himself with tongue-cloths, a laryngeal mirror, and (if using electric light) a spirit-lamp for warming the latter. The tongue has to be grasped and drawn forwards in order to increase the space between the epiglottis and the posterior pharyngeal wall, and at the same time diminish the tendency for the dorsum of the tongue to rise and shut off all access to the larynx (cf. Figs. 31 and 32). For this purpose we can make use of any clean towel, handkerchief, or serviette. It is much better, however, to have small cloths made on purpose from some soft linen, not so thin as to allow the moisture to come through, and measuring about 5 inches by $2\frac{1}{2}$ inches. A fresh one is, of course, employed for each patient. As the washing of such small pieces of stuff presents some difficulty and is not always reliable, it is more satisfactory to use what is called butter-muslin—a kind of thick, unprepared gauze. This is easily cut up into 5-inch squares. When folded in half, each of these forms an excellent tongue-cloth, quite soft, adhering sufficiently to the tongue to prevent it from slipping; thin, yet not so as to permit the passage of saliva, and leaving no unpleasant sensation. As the material costs very little, it is not only safer but cheaper to throw away each piece after use, than to employ some more expensive material and have it washed. These small portions of butter-cloth will also be found useful for wiping instruments, and for a variety of small purposes.

The laryngeal mirror.—This is made on the same principles as those indicated when describing the postnasal mirror (p. 28). It is desirable to use as large a mirror as the isthmus of the fauces and the conditions of the case will allow, both because of the more complete illumination effected and the larger view embraced, and because in many cases—probably from the fewer movements which have to be given it—it will be found to excite less reflex movement. On an average, one with a transverse diameter of an inch is sufficient, though on occasions only a much smaller one can be employed. It is firmly fixed at an angle of 120° into a straight handle.

* StClair Thomson, "The History of the Laryngoscope" (The Garcia Jubilee), *Laryngoscope*, xv., 1905, No. 3.

Examination.—The patient is seated as described for posterior rhinoscopy (p. 15). The lamp having been properly arranged on a level with the patient's ear, as close to it as convenient, and a little behind it, the first thing to do is to see that the light is so reflected as to be focused on the patient's lips. When this is done it will be found that, as the mouth is opened, the observer has only to move an inch or two nearer the patient to bring the rays at the proper focus below the soft palate. The light being arranged, the glass surface of the mirror is warmed as directed in posterior rhinoscopy. The patient is only then requested to protrude the tongue as far as possible, and the portion of it projecting beyond the lower teeth is enveloped in the tongue-cloth, so that both the upper and the under surfaces are protected when it is grasped by the examiner. This is done by

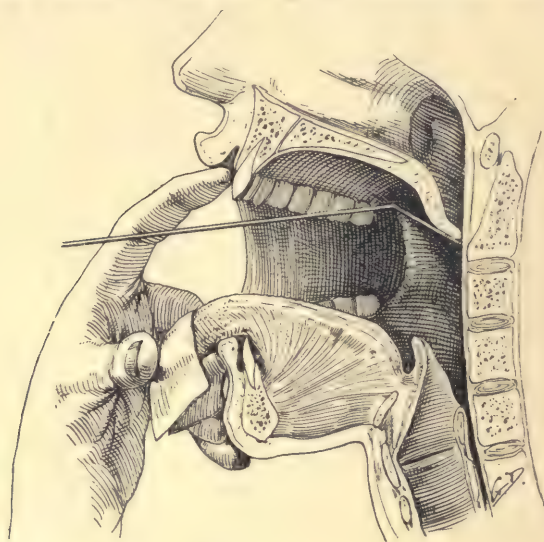


Fig. 32.—Indirect laryngoscopy.

placing the thumb on the upper surface, and the first finger on the lower, the body of the tongue being very firmly compressed (but not pinched) between them. If this grip is made too near the tip, it is much more painful, is apt to slip, and is more likely to produce reflex retraction and "rearing" of the rest of the organ. If the attempt is made to grasp the tongue too far back, we are more apt to drag the frenum against the edge of the lower incisors. This is particularly to be avoided, not only because of the entirely unnecessary pain produced, but because, in addition to setting up reflex pharyngeal movements which may entirely defeat our object, it may sever the small artery of the frenum and produce troublesome hæmorrhage. Students are generally instructed to draw the tongue gently forward. But if the tongue is freely protruded there is no need to make any traction on it. The tongue should simply be held in position outside

the lips, and never dragged there. It is only in cases where the patient hesitatingly protrudes a portion of the tongue that we are entitled gently and gradually to draw it a little farther. It is still better in such cases, when the tongue has been grasped, to invite the patient to protrude it a little farther to avoid having it pulled.

With the finger and thumb of the left hand the tongue is thus grasped and held, while the second finger rests against the front of the chin and the third finger is hitched underneath it. This steadies the hand and gives a unity to the movements of the tongue, the restraining hand, and the patient's head. If the latter is drawn back, the movement is communicated to the laryngologist's hand, which, resting against the chin, quickly follows it, and so prevents the tongue from being pulled or injured against the teeth. The chin is also so comfortably lodged in the examiner's hand that he is able to give it any direction he wishes—raising or depressing it, or turning it to one side or another so as to bring the various parts into view. If the patient has a moustache or pendulous upper lip to obstruct the view, they can be held out of the way by the observer's forefinger, while he grasps the tongue between the thumb and second finger of the same hand. The warmed mirror is held in the right hand just like a pen, with the reflecting surface facing but not touching the tongue, and in this position it is guided backwards until it passes below the soft palate to a position where it is behind the base of the tongue, in front of the posterior pharyngeal wall, and halting over the entry of the larynx at an angle of 45° to the horizontal. At this point the reflected light should be concentrated on its surface. The mirror is guided without haste but continuously backwards, and if it is slightly tilted upwards during the movement the picture reflected in it represents the various parts over the centre of the tongue until finally the edge of the epiglottis comes into view. This is the rallying-point. It then only requires that the mirror should be introduced a little farther, or inclined at an increasing angle, to bring the larynx into view. It is seldom that, with the mirror in one position, a complete view is obtained of all we wish to see. It must not only be inclined to various angles, but also directed a little to one side or the other.

As the mirror is introduced it should be seen that the observer, the mid-line of the patient, the central raphe of the tongue, and the laryngeal mirror are all in one plane. Neglect of this precaution will cause failure of proper illumination, or the larynx will not come into the field of vision. If the soft palate hangs very low, and there does not appear to be any space for introducing the mirror between it and the base of the tongue, the patient should be asked to say *E* or *Ah*, and, while the grasp on the tongue prevents it from arching upwards, the mirror is slipped back into the space formed below the contracting soft palate. The beginner is often unduly afraid of touching the soft palate, having been told that it will set up reflex contraction. As a matter of fact, there is no need to avoid mere contact with the soft palate, and in every successful laryngoscopic examination the uvula rests on the back of the mirror. Indeed, in many cases with a long or lax uvula, the back of the mirror should be slipped below it and then raised to the proper position with the uvula resting on its sloping back (Fig. 32). What should be avoided is the pinching of the uvula against the posterior wall of the pharynx, or allowing the uvula to slip over the glass surface of the mirror, or irritating it by uncertain or clumsy movements.

Laryngoscopic view.—We thus obtain a panoramic view of the larynx, and hence any picture of the larynx is always more or less a composite one, and to some degree diagrammatic. The beginner is often unnecessarily confused by being warned that in the mirror he will see everything reversed or "upside down." As a matter of fact, he will find things just as in any other mirror. This will be made quite clear by a reference to Fig. 33.

Let us start from the epiglottis, which first came into view. This is the part of the larynx which is nearest the observer. It will be noted that in the reflection in the mirror the epiglottis is the highest, and (from the obliquity of the mirror) the farthest removed. So with all the other structures—those which in the actual condition are nearest and *anterior* appear in the mirror farthest off and at the *upper* part

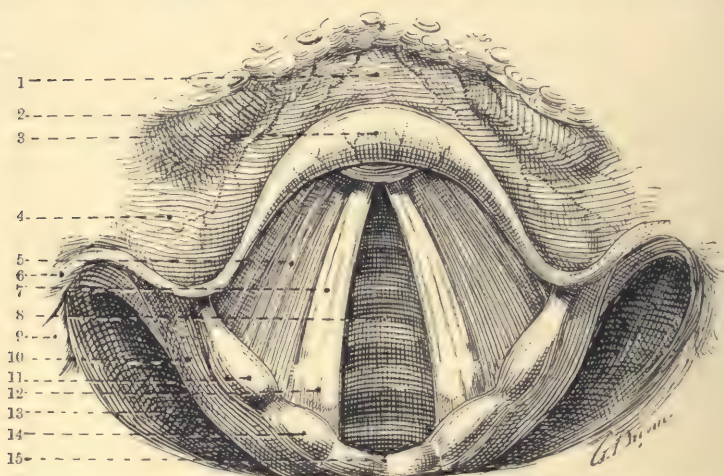


Fig. 33.—Laryngoscopic view during quiet respiration.

1, Median glosso-epiglottic ligament; 2, vallecula; 3, epiglottis; 4, lateral glosso-epiglottic ligament; 5, ventricular band; 6, greater cornu of the hyoid bone; 7, vocal cord; 8, trachea; 9, lateral wall of pharyngo-larynx; 10, ary-epiglottic fold; 11, cartilage of Wrisberg; 12, vocal process; 13, sinus pyriformis; 14, cartilage of Santorini; 15, interarytenoid fold.

of the mirror, while those which are situated at the *posterior* part of the larynx appear at the *lower* and nearest part of the mirror. In connexion with this we must remember that all illustrations of the larynx represent the condition of things as seen in the mirror, and not as actually in life. Hence in drawings it will be noticed that the epiglottis is always represented as being farthest removed from the observer, while the arytenoid region is the nearest. In the living subject, of course, the actual condition of things is exactly the opposite. Yet in writings on laryngeal conditions the words *anterior* and *posterior* are employed as descriptive of the actual anatomical relations, and not of their reflections.

The epiglottis is attached to the base of the tongue by the lateral glosso-epiglottic fold on each side, and the central glosso-epiglottic

ligament in front. Between them lie the spaces named the valleculæ, and in front of these on each side is an area of lymphoid tissue called the lingual tonsil. Behind the epiglottis is the opening of the glottis, bounded on each side by the vocal cords. These may appear to be close to the orifice of the larynx. A reference to a specimen or model will show that, on the contrary, the distance from the tip of the epiglottis to the true vocal cords is considerable, and even from the ary-epiglottic fold it is quite an inch. This impression of foreshortening which is given by the laryngeal mirror is inevitable, and must constantly be held in check in the observer's mind. It tends to give the impression that everything from the tip of the epiglottis to the bifurcation of the trachea (a distance of 17 to 17.5 cm. or 6¾ inches) is very close together. All pathological changes, therefore, appear in the mirror less extensive than they actually are, and this is most marked in the case of growths with a prominent upper margin.

* At the attached border of the vocal cord is the opening of the ventricle of Morgagni, often suggested only by a dark shadow thrown by the edge of the superjacent ventricular band. The best view of the ventricle is obtained during respiration, with the mirror facing towards the side to be examined, and the patient's head inclined to the opposite shoulder. Behind, the vocal cords diverge as they approach the arytenoid cartilages, which are surmounted by the cartilages of Santorini. Between the arytenoid cartilages lies the interarytenoid region, while externally to them the ary-epiglottic fold curves round to join the epiglottis. A slight elevation in it marks the site of the cartilage of Wrisberg. Outside the ary-epiglottic folds the mucous membrane doubles down over the cricoid plate and inside the ala of the thyroid to form the sinus pyramidalis. The white surface of these cartilages may often be seen shining through the floor. These sinuses alter in form and become more evident by asking the patient to say *E* in a high pitch. This draws the ary-epiglottic folds nearer to the middle line, and approaches the arytenoid cartilages to one another. An opportunity is thus afforded of inspecting the posterior surface of these bodies, and of the cricoid cartilage, and at the same time anything pathological at the upper extremity of the œsophagus will be revealed. No examination of the larynx is complete without seeing the condition of things during phonation, which also permits of our observing the colour and movement of the vocal cords. The vibratory movements of the vocal cords can be studied on Oertel's stroboscope.*

Below the level of the vocal cords, when the patient inspires deeply, we can see the inner surface of the cricoid cartilage, and some of the rings of the trachea, sometimes as low as its bifurcation. Generally, by tilting the mirror somewhat back and asking the patient to say *E*, we are able to get a good view of the anterior part of the larynx and of the front of the trachea. It is not so easy to inspect the posterior wall—the interarytenoid area and the region below it (Fig. 34). To succeed in this we adopt the position described by Killian. The patient stands with the head hanging rather forward, while the observer crouches or kneels before him and holds the mirror as nearly as possible horizontal and more forward than usual, i.e. nearer the

* Spiess, *Arch. f. Laryngol.*, Bd. v., S. 148.

attached border of the soft palate. This position will sometimes give valuable information as to growths on and below the posterior ends of the cords, the posterior wall of the larynx, the infraglottic region, and the trachea as far as its bifurcation.

The **difficulties** in the way of a successful laryngoscopic examination sometimes arise from faults on the part of the beginner, and at other times from difficulties on the side of the patient. The following are among the most frequent causes of failure on the part of the examiner:—

1. The light is not arranged as directed.

2. The light is not focused before beginning the examination. As a result, after the mirror has been warmed and the tongue grasped, much time is lost in illuminating the pharynx; and, as a consequence of

this, the patient becomes tired, or his pharynx irritated, by remaining so long with the mouth open and the tongue protruded. Meantime the laryngeal mirror becomes cool, and has to be warmed again.

3. The tongue is grasped before the mirror is warmed. This fatigues the patient more than is necessary, and while the laryngologist is watching the warming of the mirror he may, inadvertently, make painful traction on the tongue.

4. The tongue is pinched instead of comfortably grasped; or seized too near the point; or injured by being dragged forcibly or pressed against the inferior incisors.

5. The mirror is not sufficiently warmed, or is made too hot.

6. The mirror is allowed to become tarnished with moisture during its introduction. This frequently occurs through the patient making some movement of deglutition.

7. Reflex movements are excited through the mirror touching the tongue, or tickling the palate or posterior pharyngeal wall.

8. The mirror is not introduced properly. The general fault of beginners is that they do not introduce it far enough, and hold it at too nearly a right angle. This only gives a view of the dorsum of the tongue or the tip of the epiglottis (Fig. 35).

9. The examination is too prolonged. It is seldom that an examination should last more than thirty seconds, and it is better to make several short inspections than fatigue a patient by attempting to see everything at once.

The difficulties from the side of the patient are concerned chiefly with his general nervousness, an unmanageable tongue, and irregularities of the epiglottis. The patient should be persuaded to continue breathing in and out naturally through the mouth, and should avoid



Fig. 34.—View of the posterior wall of the larynx, i.e. the interarytenoid region, and the areas above each process vocalis.

taking a deep breath and then holding it. His nervousness can only be overcome by the exercise of patience and tact. It can never be done by roughness. Besides, we must bear in mind that even in subjects quite free from fear or nervousness, and with the best intentions to submit themselves to an examination, a complete laryngeal examination may be impossible without the use of cocaine or even a general anæsthetic. The neurotic, dyspeptic, and alcoholic are apt to have great irritability of the larynx. It is better not to make an examination soon after a meal.

One of the most usual difficulties with the tongue is the occurrence of a very short frenum, which prevents its satisfactory protrusion. Any painful affection will interfere in the same way. Then there are tongues which appear to be in constant vermicular action, quite beyond the control of the patient. This, as well as constant reflex movements on the part of the soft palate and pharynx, is best controlled by spraying or gently painting the parts—chiefly the dorsum of the tongue, the soft palate, and the fauces—with a 2 or 5 per cent. solution of cocaine. Irregular shape or position of the epiglottis sometimes interferes



Fig. 35.—Illustrates the imperfect view which beginners are apt to obtain of the larynx.



Fig. 36.—The bonnet, or omega-shaped epiglottis of children.

with a view of the larynx. It may preserve the infantile type (Fig. 36) of epiglottis, so that traction on the tongue does not lift it sufficiently to uncover the entrance to the larynx. To see past an overhanging epiglottis the observer should stand or seat himself with his head higher than that of the patient, and with the laryngeal mirror somewhat deeper in the pharynx and nearer the posterior pharyngeal wall, while its reflecting surface is tilted more forwards. Various arrangements have been devised for overcoming this difficulty. One of the simplest is to use a Fraenkel depressor, instead of a tongue-cloth, and press the whole organ forward and downward so as to raise the epiglottis from the posterior wall, while the patient says, in succession, *Ah, Eh, E*. Special instruments have been devised for introduction down to the base of the tongue, where, by pressing on the glosso-epiglottic ligament, they will tilt forward the epiglottis. The epiglottis itself may even be hooked forward with a bent probe, if it is first rendered thoroughly insensitive by cocaine, while the patient holds his own tongue.

Various self-acting epiglottis-lifters have been designed to meet those cases where the overhanging epiglottis makes it quite impossible to

obtain a view of the anterior part of the cords.* I can warmly recommend the ingenious instrument designed by Cyril Horsford (Fig. 37).† Finally, in a few cases, and often with children, we must abandon the efforts to obtain a view by the laryngeal mirror and secure this by direct laryngoscopy (see p. 46).

Digital examination.—In some cases a satisfactory examination of the base of the tongue, the neighbourhood of the epiglottis and the entry to the larynx can be made by the examiner grasping the tip of the tongue—protected with a napkin—in one hand and sweeping the forefinger of the other over the region of the lingual tonsil on each side, the vallecula, the lower part of the palatine tonsils, the epiglottis, glosso-epiglottic and aryteno-epiglottic folds, and the sinus pyriformis. The forefinger can even, in some cases, be introduced into the larynx and serve for distinguishing the degree of induration of intralaryngeal growths. In anesthetized children this can be done without difficulty. In detecting early malignant growths in the pharynx, palpation with the finger, as a source of information, is superior to all others.‡



Fig. 37.—Instrument for passing a ligature through the epiglottis, so as to lift it and permit a view of the larynx.

The probe is employed to test the sensitiveness of the larynx, to control the anæsthetic action of cocaine, to detach sloughs or membrane, to determine the attachment and consistency of a growth, or to distinguish it from a slough or necrosis.

The Röntgen rays are employed in the case of suspected metallic foreign bodies.

Laryngoscopy in children.—The examination of the larynx in children presents particular difficulty, not only on account of their indocility, but because of special anatomical particularities met with in early life (Fig. 36, and Fig. 228, p. 483)

The frenum linguæ is very short. The epiglottis is always longer and more prominent than in the adult, and so much less erect that it tends to conceal the entrance to the larynx; it may be lance-shaped, gutter-shaped, or more of an omega-form. In early childhood the hyoid overhangs the thyroid cartilage, and thus conceals the anterior

* Mermod, *Ann. des Mal. de l'Oreille*, 1906, ii, p. 399.
J. W. Gleitsmann, *Laryngoscope*, May, 1907.

† *Brit. Med. Journ.*, May 3, 1913, p. 928.

‡ Wilfred Trotter, *Lancet*, April 19, 1913.

part of the larynx. Under four years of age the axis of the larynx is slightly incurved backwards, so that the space between the cricoid and the thyroid is diminished, thus obscuring the view of the deeper part of the larynx (Bauer). Swallowing movements are very frequent, and the pharyngo-larynx is apt to fill up with saliva and mucus. With patience young children can in many cases be trained to show the larynx. Sometimes the method recommended by Lack is successful. The child is held on a nurse's lap and the head steadied



Fig. 38.—Position for holding a refractory child.

The arms are enveloped in a sheet, so that the hands are controlled with the nurse's left hand, leaving the right one free to steady the child's head against her right shoulder. His feet are tucked in beneath her knees, so as to prevent him from slipping off her lap. This position is useful in examining the pharynx, in making a digital examination of the naso-pharynx, and for intubation.

against her chest (Fig. 38); sometimes a gag is required. A tongue-depressor with a curved end is then introduced over the base of the tongue and hooked round the hyoid bone (Fig. 19). If the end of the depressor is gently pulled forwards, and a small-sized laryngeal mirror is used in the ordinary way, a view of the larynx may be obtained.

Not infrequently a general anæsthetic—preferably chloroform—will be required. Scanes Spicer combines it with the local application

of a weak solution of cocaine. This allows of a lighter anæsthesia, and the child is examined as in ordinary laryngoscopy, while held in a sitting posture in a nurse's arms. When a child cannot be examined in the usual way, it is better to anæsthetize it with chloroform and view the larynx by Killian's method of direct laryngoscopy (*see below*).

In cases of marked laryngeal stenosis no examination should be initiated without having at hand the necessary instruments for a tracheotomy, which may be suddenly required.

Hypopharyngoscopy.—The lowest part of the pharynx—that lying behind the larynx and terminating at the œsophagus—is invisible to ordinary methods of examination, and yet this is a region where strictures, growths, foreign bodies, tubercle, and syphilis are not uncommonly met with. Under cocaine, von Eicken's "larynx lever" can be inserted behind the epiglottis and passed through the glottis into the subglottic space, so that the larynx can be drawn forwards until it is $1\frac{1}{2}$ to 2 cm. distant from the posterior pharyngeal wall.* The observer then kneels before the patient, as the latter must incline the head forwards so as to relax the muscles on the front of the neck. The laryngeal mirror is placed in the usual position.

The method has not the risks of direct œsophagoscopy (p. 49) in this region, where the ordinary examining tube might force a foreign body into the wall of the gullet, or even perforate the latter if diseased. These dangers are, however, avoided by using Mosher's or Hill's examination spatula, or by suspension laryngoscopy (p. 49).

DIRECT LARYNGOSCOPY, BRONCHOSCOPY, AND ŒSOPHAGOSCOPY †

Direct laryngoscopy. Killian's method.—When the base of the tongue is firmly depressed, and drawn forwards, it is possible in some cases, and particularly in children, to obtain a direct view of the

* Carl von Eicken, *Arch. f. Laryngol.*, Bd. xix., 1907, Heft 2, S. 213.

P. Tetens Hald, *Lancet*, May 25, 1907.

† E. B. Waggett, in Allbutt and Rolleston's "System of Medicine," 1908, vol. iv., part ii., pp. 299-322.

Chevalier Jackson, "Tracheo-Bronchoscopy, Œsophagoscopy, and Gastroscopy." St. Louis, Mo., 1907. (Very full bibliography.)

H. S. Souttar and Theodore Thompson, *Brit. Med. Journ.*, Sept. 25, 1909, p. 843.

E. Fletcher Ingals, "Bronchoscopy and Œsophagoscopy: the Technique, Utility, and Dangers," *Laryngoscope*, xix., 1909, No. 7, p. 495.

Thomas H. Halsted, "The Practicality of Bronchoscopy and Œsophagoscopy," *ibid.*, p. 519.

W. Brünings, "Die direkte Laryngoskopie, Bronchoskopie und Œsophagoskopie." Wiesbaden, 1910.

M. Mann, "Atlas zur Klinik der Killianschen Tracheo-Bronchoskopie." Würzburg, 1911.

"Atlas of Killian's Tracheo-Bronchoscopy," by Dr. Mann, translated by Thomas Guthrie (Liverpool). London, 1911.

J. Guisez, "Traité des Maladies de l'Œsophage." Paris, 1911.

W. Brünings, "Direct Laryngoscopy, Bronchoscopy, and Œsophagoscopy."

Translated and edited by W. G. Howarth. London, 1912.

Boutin, "L'Examen de l'Hypopharynx et de la Bouche de l'Œsophage," *Ann. des Mal. de l'Oreille*, xxxix., 1913, No. 5, p. 446.

M. Mann, "Lehrbuch der Tracheobronchoskopie." Würzburg, 1914.

H. P. Mosher, chap. v. in "Year-Book of Laryngoscopy, Tracheoscopy, Bronchoscopy, Œsophagoscopy, and Gastroscopy," by H. W. Loeb. St. Louis, U.S.A., 1914.

Chevalier Jackson, "Peroral Endoscopy and Laryngeal Surgery." St. Louis, U.S.A., 1915.

epiglottis. This fact was made use of by Kirstein, who was one of the first to demonstrate that by the use of a special tongue-depressor it was possible to throw a beam of light into the interior of the larynx, particularly if the head were thrown upwards and backwards in extreme extension. The method is, of course, not superior to ordinary laryngoscopy, and for adults the latter is nearly always practicable. It is too painful to be used in children without a general anæsthetic, and has been superseded by the use of Killian's tubes.

The latest improvements in the instrumentarium of Killian's endoscopic methods have been designed by Brünings (Fig. 39). A handle of rectangular form contains a powerful electric light which can be reflected down the examination tube and carefully focused. To this can be attached a tube-spatula either 15 or 20 cm. (6-8 in.) in length, with a telescopic extension equally long, so that the one instrument can be extended to a depth of 40 cm. (16 in.). The rectangular handle and the lamp can be withdrawn 3 or 4 in. away from the upper end of the bronchoscope, to allow of the introduction and manipulation of various instruments, which can be elongated in the same telescopic manner. The field is kept clear of mucus and secretions by a suction-pump and a good supply of cotton-wool mops. In adults direct inspection of the larynx can be carried out after applying a 10-20 per cent. solution of cocaine to the pharynx, epiglottis, and the base of the tongue. The patient sits on a low stool with the body thrown forwards and the head extended, so as to bring the upper air-tract into as nearly a straight line as possible. The position recommended by Mouret, with the patient astride a chair, I have found most useful for all direct examination. It brings the air and food passages into as straight a line as possible, and, it being easier for the patient, he is able to maintain the pose without the aid of an assistant.* A tube 15 to 20 cm. long, and with a diameter of 9 to 11 mm., is sterilized and warmed, and introduced gently until it lays hold of the epiglottis,

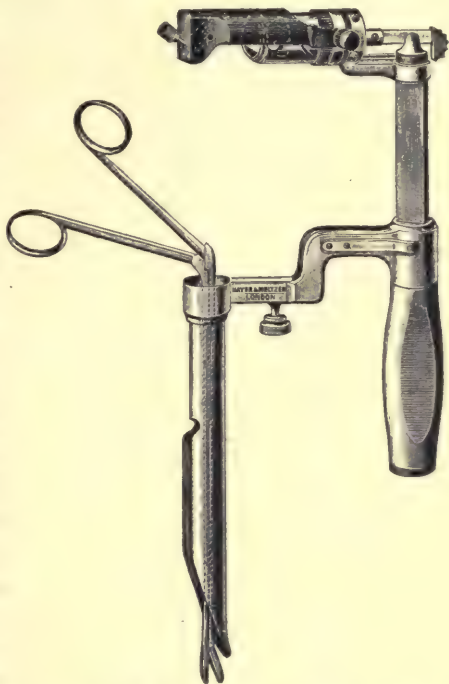


Fig. 39.—Killian tube fitted with a Brünings' handle, with Paterson's forceps in position for operating on the larynx.

* *Internal. Cong. Med.*, London, 1913, Section xv., Part II.

which is then tilted forwards so that the beak of the tube engages in the aditus ad laryngem. Care must be taken that the patient's upper lip does not get pinched against the teeth. With a frontal electric searchlight, or Brünings' lamp, the interior of the larynx and the movements of the cords can easily be observed.

Contra-indications.—Caution must be used in all these manipulations to avoid cocaine intoxication, particularly in children. Marked arterio-sclerosis, valvular disease of the heart, or aneurysm would add a considerable risk to these examinations. If there is extreme dyspnœa, relief should first be given by the performance of tracheotomy.

Direct laryngoscopy in children.—Killian's method is particularly suitable for children, but complete general anæsthesia is required. The horizontal position is the best, with the head well extended over the end of the table and supported by an assistant. A tube about 10 to 15 cm. long, and with a diameter of 5 to 7 mm., is employed. Owing to the smallness and delicacy of the larynx in children, it is better to use a tube with a bifid extremity. This is introduced until it reaches the front of the base of the epiglottis, and then by pressing the root of the tongue forwards the larynx is tilted into view, and can be operated on with suitable instruments. Paterson's forceps are well suited for papillomata (Fig. 39, p. 47).

Direct tracheoscopy.—In adults this may be carried out in a sitting position, after spraying or painting the pharynx and larynx with a 10-20 per cent. solution of cocaine. In nervous patients it is well to give a hypodermic injection of morphia twenty minutes before the examination is begun (morphia gr. $\frac{1}{6}$, atropine gr. $\frac{1}{200}$). The bevelled end of the tube is passed through the rima glottidis until the walls of the trachea are brought into view. All the steps are controlled by the eye, the parts being well illuminated with Brünings' lamp. In many cases a general anæsthetic is required, and of course is inevitable in children.

Lower direct tracheoscopy.—If there is an opening in the trachea direct examination can be carried out through the tracheotomy wound. The trachea is cocainized, and the patient placed in a sitting or horizontal position. The head being bent slightly backwards and to one side, a tube 5 to 15 cm. long and up to 14 mm. in width is inserted through the opening in the neck. The trachea, its bifurcation, and the entrance to the main bronchi are then plainly visible. Each bronchus is best seen by moving the handle of the instrument towards the opposite side.

Direct bronchoscopy.—It is not more difficult to introduce a tube along the natural passages into a bronchus than it is to pass it through a tracheotomy wound. Most patients can tolerate the proceeding under morphine and cocaine, but some of them must be chloroformed. In adults a tube which will extend to 30 or 35 cm. (12-14 in.) is necessary; in children, one of 15 to 25 cm. (6-10 in.) length is required. Reflexes must be controlled by painting the epiglottis, larynx, and bifurcation of the trachea with cocaine. The main bronchi are painted with a 10 per cent. solution of cocaine. The right bronchus is more easily manipulated than the left. When the tube is passed 4 or 5 cm. (2 in.) along a main bronchus, the air-passage is so straightened out that it is even possible to penetrate bronchi of the second or third degree (Fig. 298, p. 752).

Lower direct bronchoscopy.—This is effected through a tracheotomy wound by the method described on p. 48.

Œsophagoscopy.—Direct inspection of the interior of the œsophagus can be made by the use of Killian's tubes (Fig. 266, p. 610).

Anæsthesia.—In children a general anæsthetic is necessary. In adults, local anæsthesia is sufficient, and is secured by painting the pharynx, aditus laryngis, right sinus pyriformis, and the posterior cricoid region with a 10–20 per cent. solution of cocaine. A preliminary injection of morphia and atropine is helpful. Anæsthesia, both local and general, is frequently dispensed with by Chevalier Jackson.*

Position.—The patient may be seated on a low stool, or be horizontal on a table, either on the right side with the head extended, or on the back with the head hanging over the end of the table.

Instruments.—The telescopic tube can be elongated to 20 or 50 cm. (8–20 in.), according to the depth of the spot to be examined. The diameter of the tube should be 7 mm. for children, 9 mm. for females, and 9–13 mm. for male adults. The use of a conical bougie to serve as a director is unnecessary.

Method.—The tube is purified, warmed, and lubricated. The patient's head is extended and supported, while it is inclined slightly to the right. The beak of the œsophagoscope is passed over the epiglottis and hitched behind the arytenoids. If this region has been well cocaineized, the mouth of the œsophagus will open, allowing the instrument to slip down the gullet. The telescopic projection is extended as required, while its descent is controlled by looking through it. The field of vision is dried by swabs and by an aspiration pump. The upper portion of the œsophagus can be readily inspected with Mosher's open speculum, which is very useful for growths or foreign bodies situated behind the cricoid cartilage.†

Contra-indications.—The hypopharynx must first be carefully inspected, from fear of penetrating any malignant infiltration or pushing a foreign body farther down the gullet (cf. p. 742). Large aneurysms, mediastinal tumours, cervical caries and abscess, and foreign bodies which have produced cellulitis or emphysema, would render œsophagoscopy very dangerous. A stricture should never be forced. The œsophagus in disease becomes a very fragile tube, and no inconsiderable number of fatalities have resulted from unskilled manipulation.‡ No force is ever employed. (Cf. pp. 594 and 751.)

Suspension laryngoscopy.—This modification of direct laryngoscopy has been devised by Killian, and permits as good a view and a still better field of manipulation for affections of the larynx and lower pharynx.§

Anæsthesia.—A hypodermic injection of morphia gr. $\frac{1}{8}$ and scopolamine gr. $\frac{1}{200}$ is given two hours before operation and repeated after one hour. In children under 16 chloroform anæsthesia is advisable. Painting with 10 per cent. cocaine may also be required.

* *Trans. Amer. Laryngol. Assoc.*, xxxiv., 1912, p. 88.

† *Laryngoscope*, xix., 1909, No. 6, p. 401.

‡ Carl von Eicken, D. R. Paterson, and W. Hill, *Brit. Med. Journ.*, 1910, ii., Nov. 19, p. 1613.

§ G. Killian, *Journ. of Laryngol.*, xxix., July and Aug., 1914, p. 337.

Position.—The patient lies flat on his back on a firm table, with the head and neck extended over the end and supported by an assistant until the suspension instrument is fixed.

Instruments and method.—Clamped to the edge of the table is an upright, bearing a movable horizontal bar, and on this is suspended a hook (Fig. 40). A special spatula is slipped over the tongue and epiglottis of the patient and then fixed to the hanging hook (Fig. 41). In this way the patient's head remains suspended by the spatula, with a free direct view into the larynx and lower pharynx. The region is illuminated by an ordinary frontal mirror, by a Kirstein lamp, or by a forehead search-light (Fig. 10, p. 15).

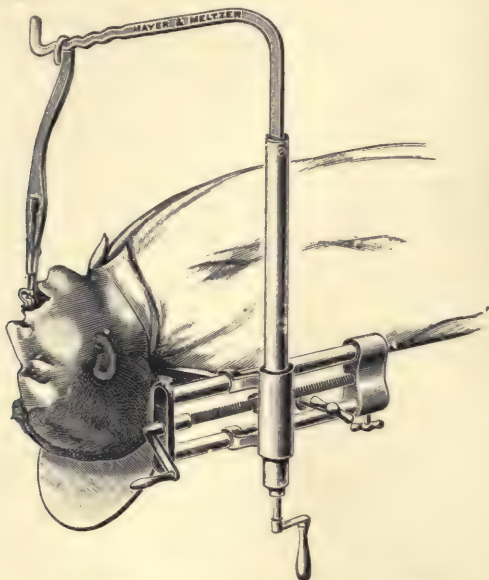


Fig. 40.—Suspension laryngoscopy.

Shows the scaffold, clamped on to side of operation table, with bar hanging from it and connected with the spatula introduced into larynx.

Indications.—The large, well-illuminated field and the possibility of having two hands free for manipulation make this method particularly suitable for all manipulation in the neighbourhood where the ordinary indirect technique is insufficient. Hence, it is the method of choice for treating foreign bodies impacted in or behind the larynx, for examining the pharyngo-larynx, for curetting or cauterizing a tuberculous larynx, or for such operations as the removal of laryngeal papillomata in children, in whom the procedure is much simpler than in adults* (p. 520).

Contra-indications.—It is not so suitable in patients with stiff necks, or who are unable to open the mouth widely. It is useless

* W. Albrecht, *Journ. of Laryngol.*, xxix., Feb., 1914, No. 2, p. 71.

for viewing the œsophagus and bronchi; but, if required, the œsophagoscope and bronchoscope can be used while the patient is in the position for direct laryngoscopy.*

The pharyngoscope.—An ingenious electrical speculum has lately been designed by Harold Hays which permits of inspection of the

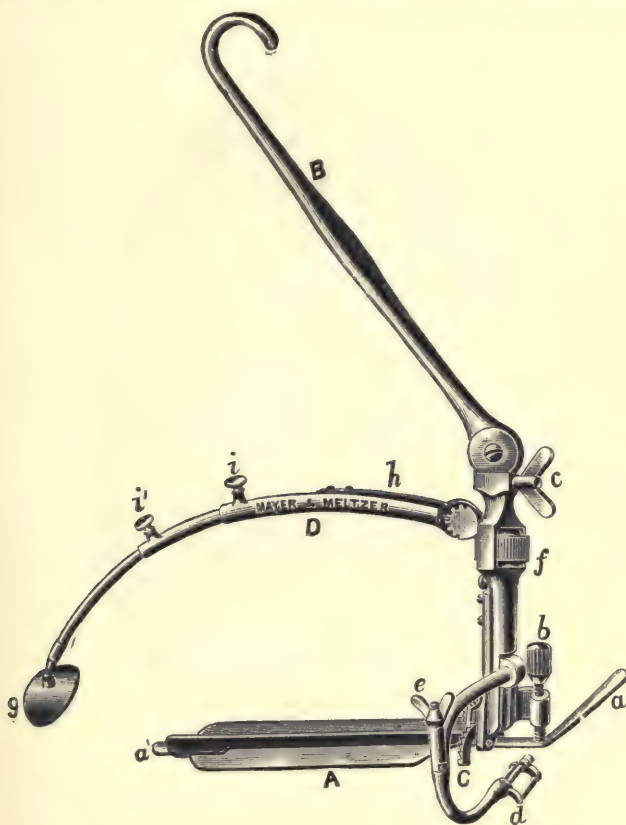


Fig. 41.—Suspension laryngoscopy.

A, Plates for restraining the tongue; a, a', spatula to be introduced into the larynx, behind the epiglottis; D, g, arm and plate for making pressure on cricoid from outside, so as to straighten the air-way; B, arm by which apparatus and patient's head are suspended, as shown in preceding figure; C, gag.

pharynx, posterior nares, Eustachian tubes, and larynx, even when the lips are closed over the barrel of the instrument. It is not available for the application of local treatment, but it may prove of value

* G. Killian, *Arch. f. Laryngol.*, xxvi., No. 2; *Berliner klin. Woch.*, März, 1912, No. 13, S. 581.

Edward D. Davis, *Brit. Med. Journ.*, Jan. 18, 1913, p. 115.

to those who are not skilled in laryngoscopy, and, as it is very portable, it might be useful in bedside examinations or country practice.*

Direct gastroscopy.—With an œsophagoscope tube, elongated to 70 or 80 cm. (28–32 in.), Chevalier Jackson and W. Hill have shown that the greater part of the mucosa of the stomach can be inspected, lesions diagnosed, and, in some cases, treatment applied.

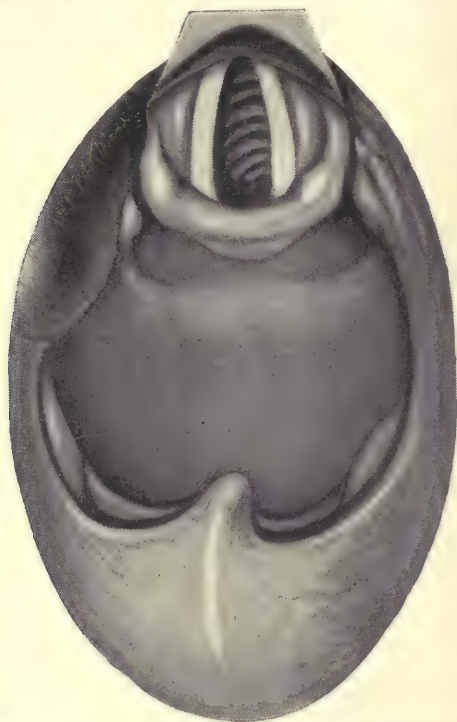


Fig. 42.—View obtained by suspension laryngoscopy.

Complementary general examination.—The examination of the nose and naso-pharynx is often not complete without a careful examination of the ears. Affections of the pharynx will frequently require an investigation of the skin for rashes or traces of syphilis. Examining the larynx may entail the investigation of the neck for enlarged glands. Paralysis of a vocal cord not only demands a careful examination of the neck, but also of the thorax and the general nervous system. Affections of the

* Harold Hays, *Laryngoscope*, xix., 1909, No. 7, p. 528.

Percy Fridenberg, *ibid.*, xix., 1909, No. 7, p. 535.

J. Garel, *Ann. des Mal. de l'Oreille*, xxxv., ii., 1909, No. 11, p. 529.

œsophagus require an exploration of the neck and chest. A laryngeal catarrh may escape diagnosis if the chest, temperature, and sputum are not investigated. In certain cases the eyes, stomach, liver, kidneys, require careful examination. The blood-examination, the chemical, bacterioscopic, or microscopic examination of discharge, membrane, sputum, or removed tissue, will not be overlooked when called for.

Needless to add that the previous family history of the patient, his occupation, habits, surroundings, as well as his general vitality, will all require consideration.

The use of the Röntgen rays, both in diagnosis and in treatment, will be referred to later on.

The laryngoscopic image can be demonstrated to a class by means of the Meyer-Yonge apparatus, or by a lateral attachment to a Brünings' inspection handle.

II. GENERAL SYMPTOMS

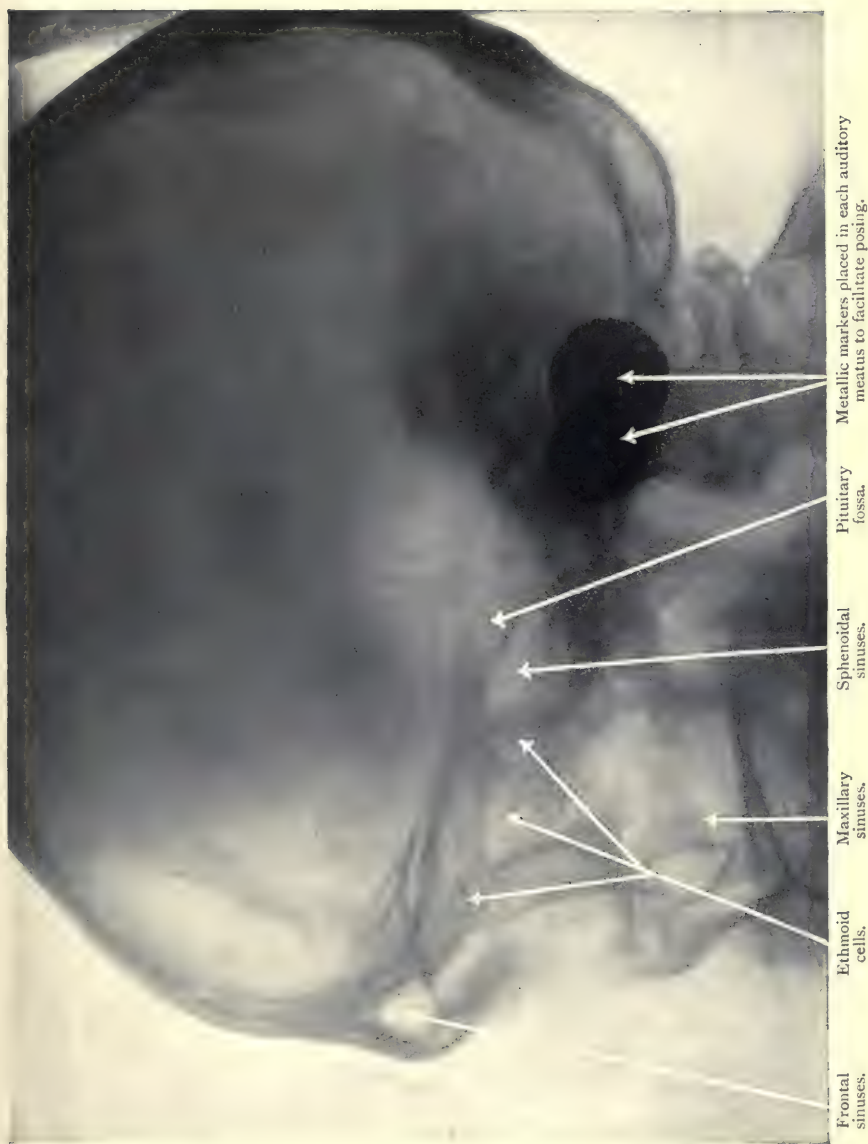
The symptoms common to each region, as well as to each disease, will be referred to in the progress of this work. Only a few suggestive points will now be mentioned, in addition to those to be given in the chapter on Catarrh. (Chap. VI., p. 101.)

Fever.—This chiefly occurs in acute affections of the tonsils and sinuses; it is rare in diseases of the nose and larynx. It varies with the age of the patient and the stage of the disease. A continued, irregular rise of temperature should always raise the suspicion of tuberculosis. The temperature may be normal in diphtheria, and is seldom so high as in tonsillitis. If there are tonsillar symptoms without a peritonsillar abscess or other local condition sufficiently acute to explain the rise of temperature, the various exanthems should be thought of, particularly scarlatina and measles. If, in any case, the temperature is not proportionate to the symptoms, affections originating in other parts of the body should not be overlooked.

Cough.—Cough is chiefly of laryngeal origin. But it may be caused by reflex stimulus in the pharynx, nose, ear, or gastrointestinal tract. It not infrequently originates from irritation on the posterior wall of the trachea when bronchial or pulmonary secretion reaches there. The sensitiveness of this area is shown when the posterior tracheal wall is touched through a tracheotomy opening. In many of the patients who consult a laryngologist for "a throat," or for what they call "a throat cough," the true sources of their trouble must be sought elsewhere. Often the cause will be discovered in the nose, and not infrequently it will

be found in the condition of the gastro-intestinal canal, or in emphysema and other catarrhal states of the lower air-passages.

Dyspnœa.—This is, of course, more marked on exertion; but it is so apt to be increased at night that any suspected case should be observed while the patient is asleep. This nocturnal increase of dyspnœa is more apt to occur with laryngismus stridulus, the laryngitis of children, laryngeal diphtheria, pertussis, and the various sensory and motor disturbances of the vocal cords. The character and causes of stridor are described in the chapter on Stenosis of the Larynx and Trachea (*see* p. 583).



Left lateral skingram of the head, to show normal outlines of healthy sinuses. (*Finzi*.)
 (In the particular case from which this photograph was made, the negative X-ray findings were confirmed by exploratory lavage of the maxillary and sphenoidal sinuses.)

CHAPTER III

ON TREATMENT

DISEASE in the nose and throat involves both medical and surgical treatment. Drugs are employed both by internal administration and by topical applications. Surgical measures are carried out by external operations, or *per vias naturales*.

Many local manifestations of chronic infections, such as syphilis or tubercle, or of general disorders, such as cardiac, renal, or hepatic disease, chiefly depend for their relief on the recognition and treatment of the systemic disorder. In some cases—like the epistaxis of cirrhosis of the liver, the chronic pharyngitis of diabetes, or the laryngeal paralysis due to aneurysm—the condition in the air-passages may call for local relief, but must be regarded chiefly as symptomatic.

Progress in this department of practice tends towards increased attention to local treatment. But evolution is sometimes seen in the opposite direction—as in diphtheria, where topical measures are now of secondary importance; or in tuberculosis, where local applications may sometimes be omitted.

The general and medical treatment of the patient can never be overlooked. It not only entails a consideration of general health, age, sex, occupation, and environment, but home, food, clothing, and habits may require investigation. Dust, alcohol, and tobacco are particularly pernicious factors in diseases of the upper air-passages. The misuse of the voice, faulty speaking and breathing, defective mastication, and neglect of care of the teeth and mouth call for special attention. In females menstruation, pregnancy, and the menopause will influence throat affections.

The general progress of surgery, improved technique, local anæsthesia, and the control of hæmorrhage have tended to replace local medication by surgical measures. Doubtless there has been some excess of zeal in this direction. It is not right to submit to operation a patient who can be cured without. Yet in some cases local medication may be more tiresome to patients, and less satisfactory, than a suitable operation; and during the time spent

over prolonged general treatment changes may take place which cannot afterwards be rectified. On the other hand, there are conditions which, in view of our incomplete knowledge, or in regard to the age, sex, health, or environment of the patient, had better be palliated by local and general medication than submitted to operation,

The investigation and treatment of disease of the nose and throat require as much consideration from the physician as from the surgeon. In this region it is particularly important that each case be judged and treated individually. A local condition may make the life of one patient miserable, while in another it may hardly be noticed; at one age it may demand attention, while at another it may be wiser to leave it alone.

If more attention is given in the following pages to etiology, technique, local applications, and surgical measures, and less to medical treatment, it is because the latter subject can be better studied in general treatises on Medicine.

CLEANSING METHODS

THE NOSE

Cleansing the nose.—The simplest and safest method of clearing the nose is by blowing it. Children have to be taught this proceeding, and even adults who have suffered from nasal obstruction from early years seldom accomplish it satisfactorily. It is not sufficient simply to wipe the end of the nose. A full breath of air is first taken, and the expiratory blast is driven down one nostril while the other is closed. The process is repeated for the other nostril. This expels all secretion into the handkerchief. After the use of cleansing lotions, and when blood or pus requires removal, the patient inclines his head over a tray or slop-basin, and, closing one nostril with the forefinger of the same side, he clears the opposite nostril, like the "man in the street"—*à la paysanne*, as it is termed in France. It is always well to inspect the nasal cavities before they are cleansed, as the exact source of discharge or blood is the more easily ascertained. If crusts or scabs are present they can be lifted out with forceps, sometimes after the local use of cocaine and peroxide of hydrogen.

WATERY LOTIONS

Composition.—The sensitiveness of the nasal mucosa, the susceptibility of the olfactory nerve, the importance of not injuring ciliated epithelium, and the consideration demanded by the delicate

vaso-motor arrangement in the turbinals, make it important to use great care in prescribing intranasal medication.

Strong antiseptics and astringents must be avoided. All nose lotions should be alkaline and isotonic with the blood plasma, thus avoiding the painful and injurious effects of watery sprays, or those which are of too high a specific gravity. This condition is met by prescribing borax in 2·5 per cent., soda in 1·5 per cent., or salt in 0·7 per cent. solution; i.e. 10 gr. of borax, 6 gr. of soda, or 3 gr. of salt to 1 ounce of warm water. Generally speaking, this is best done by prescribing several of these alkalis in the strength of about 5 gr. each to the ounce. They may be rendered more pleasant by the addition of white sugar or glycerin (Formulæ 8 and 11). The addition of a small amount of some mild antiseptic—menthol, thymol, oil of eucalyptus, oil of wintergreen, carbolic, sanitas, listerine, or euthymol—may give a pleasant flavour. All antiseptics, however, have a slightly irritant action which is disagreeable if there is an intact mucosa, though they may be helpful in certain states of ulceration or intranasal sepsis. When the Schneiderian membrane is more or less damaged, when there are foreign bodies, sloughs, or necrosis in the nasal chambers, these or similar antiseptics can be employed, though always with an alkaline basis. Most of the proprietary nose-lotions are made up on the above alkali basis, with the addition of various aromatic antiseptics. (Formula 10.)

Nose lotions should be employed tepid (102° to 106° F. = 39° to 41° C.). They may be commenced at 35° C. (96° F.), but the nose can be accustomed to 45° C. (112° F.) or 48° C. (120° F.); the warmer the better, as heat reduces the congestion of the turbinals and stimulates phagocytosis. As the skin of the nose is more sensitive to heat than the nasal mucosa, the warmer lotions must be used from a glass pipette or nasal syringe. If used in a spray, the temperature may be disregarded, as the liquid is slightly warmed by spraying, and the chilling of the mucous surface is less rapid.

Methods of use.—Lotions may be sniffed, irrigated, syringed, or sprayed into the nostrils.

The nasal douche (Weber's) is generally condemned, from the risk of pressure driving the fluid into the Eustachian tube, and setting up otitis media. If the reservoir is not raised more than a foot above the patient's head (Fig. 43), this danger can be avoided when the following rules are observed. They are applicable to the use of all watery lotions in the nose:—

1. The fluid should be tepid and sterile.
2. If both nostrils are affected, the fluid is first directed along the obstructed side.

3. The nozzle should be directed along the lower and middle meatus, and not into the upper part of the nose.
4. The patient continues breathing gently in and out through the partially open mouth. The liquid then tends to flow in through one nostril and out through the other.
5. Swallowing movements must be avoided; if uncontrollable, the administration must be stopped.
6. Blowing the nose, as ordinarily done, should be avoided. After



Fig. 43.—The syphon nasal douche (Weber's).

the bulk of the fluid has escaped, or has been hawked out through the mouth, the nasal cavities are cleansed (*à la paysanne*) as above described.

The douche is best reserved for chronic cases of intranasal suppuration—*ozæna* or syphilis—when other methods are less effective, and when the patient has learnt to manipulate it without risk.

Sniffing is the most generally employed method, as it is simple, quick, and convenient, and the lotion follows the natural direction of the inspiratory air-current through the nose. It is the most effective method when the liquid has to act on the upper area of the nose—the neighbourhood of the orifices of the frontal, ethmoidal, or sphenoidal cavities.

The patient pours the liquid into the palm of one hand and sniffs it up through the nostril on the same side, while the other orifice is closed with the forefinger of the opposite hand. The process is then reversed. If the head is inclined forwards after each sniff, the fluid readily escapes and the nostril is cleared as described (p. 50). If the depth of the nose or the naso-

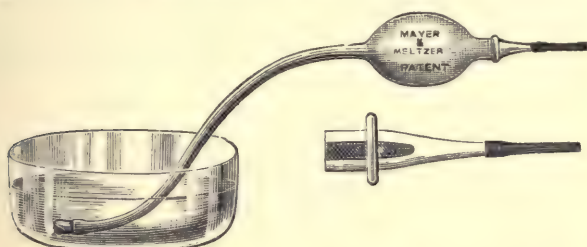


Fig. 44.—Higginson syringe for cleansing the nose—W. Wingrave's modification.

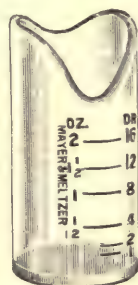


Fig. 45. Nasal cup.

pharynx requires washing, the face is tilted upwards, and the fluid runs into the pharynx and is hawked out through the mouth.

The objection to this method is that it is not a very aseptic proceeding. As a matter of practice, except after operations in septic conditions, this objection is theoretical. But it is avoidable by the use of an irrigator (Fig. 44), or a nasal cup or nasal bath (Figs. 45 and 46). In hospital practice, as a substitute for the latter, the patient can be instructed to purify the lower part of a soap-dish, and use it as directed, instead of the palm of the hand. Children can generally be coaxed to sniff the fluid out of a purified tablespoon.

Syringing the nose is required when a stream of lotion has to be directed with some force, generally for detaching crusts in the nasal or postnasal space.

A one-ounce, all-rubber, pear-shaped syringe is employed (Fig. 47), or an enema syringe holding 3 to 4 ounces. Care must be taken that discharge is not sucked back into the ball; if this occurs

it should be filled with carbolic lotion to purify it. This possibility is avoided by using a Higginson syringe.

A spray, driven by a single ball, is a good and safe method of applying watery lotions in the nose. It is most suitable when only the anterior part of the nose requires medication. (Fig. 48.)

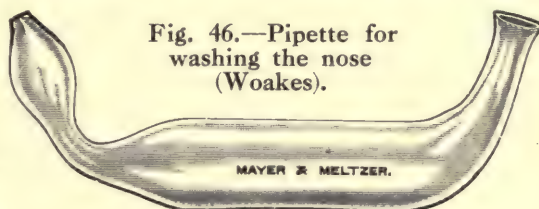


Fig. 46.—Pipette for washing the nose (Woakes).

THE NASO-PHARYNX

The naso-pharynx in health is kept clear by the protective mechanisms of the nose, and its natural mucus passes uncon-

sciously into the pharynx. The instinctive method of clearing it is by hawking through the mouth.

The cleansing of this region is effected most simply by directing the lotion through the nostrils, and accordingly the same directions as for nasal washes apply for the composition, temperature, and method of administration. Sniffing or syringing will be more effective than the spray. The cavity may also be reached directly by a spray with a suitable nozzle directed through the mouth, or by a postnasal syringe.

THE PHARYNX

This region is not provided with ciliated epithelium or with the special turgescient mechanism in the nose. Hence we can



Fig. 47.—Pear-shaped nasal syringe, all rubber, and holding 1 oz. (30 c.c.).



Fig. 48.
Nasal and
pharyngeal
spray.

employ a variety of astringent and other remedies which are inapplicable in the nose.

The alkaline lotions (Formulae 8 to 11, p. 801) are valuable for dissolving and clearing away thick or adherent mucus, membrane, or slough. Various antiseptics, unsuitable in the nose, can be added for their purifying or deodorizing action; boric acid, salicylic, carbolic, permanganate of potash, formalin, lysoform, biniodide of mercury, or corrosive sublimate may be indicated in septic conditions. Various astringents, such as alum, tannin, sulphate of copper, sulphate and sulphocarbolate of zinc, perchloride of iron, chromic acid, nitrate of silver, argyrol, or collargol, can be employed when indicated.

They can be used cold or warm, according to the indications of the case.

Aqueous solutions are best applied to the pharynx through a coarse spray, the tongue being restrained, if necessary, by a spatula.

Another method is by a 3-4 oz. rubber ball-syringe, a Higginson

syringe, or a small syphon douche. If the patient first takes a deep breath, and then expires slowly through the open mouth, the region of the tonsils, fauces, soft palate, and pharynx can be thoroughly irrigated by a good flow of fluid, of which the impact has a valuable mechanical effect in many conditions.

Gargling is the ordinary method of medicating this region, but it is doubtful if the fluid ever reaches the lateral or posterior walls of the pharynx. A few become expert at it by simulating the action of deglutition without actually swallowing the liquid.

THE LARYNX

The larynx can be washed out with a suitable syringe, under the control of the laryngeal mirror. The patient holds his own tongue, and is directed to take a deep breath and then say a prolonged *E*. This prevents the liquid from entering the trachea, while it is distributed on the vocal cords and flows all over the aditus ad laryngem. The larynx is sprayed in the same manner; when the patient finishes a long *E* he should be directed to close the mouth and take deep breaths in and out through the nose. This helps to prevent laryngeal spasm. (Fig. 49.)

The solution can be warmed for acute conditions. The cold liquid is probably more effective in chronic disorders.

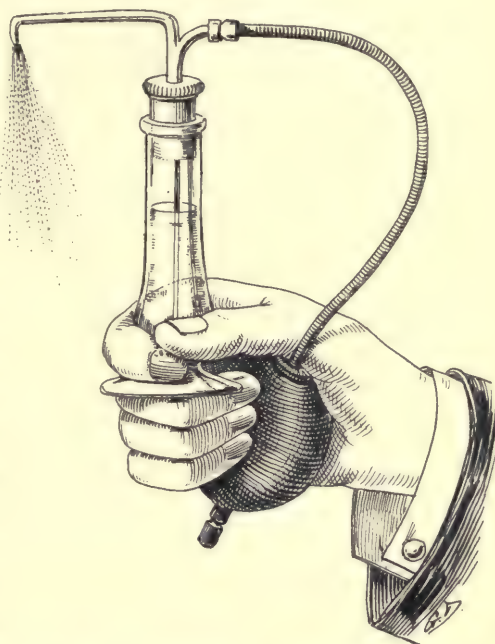


Fig. 49.—Method of using a laryngeal spray.

The instrument is manipulated entirely by the right hand, leaving the left free to hold a laryngeal mirror. The tip of the instrument should be short and bent at a little less than a right angle. This helps to avoid contact with the epiglottis, and allows of the spray being directed downwards and forwards—which is the axis of entrance to the larynx (cf. Fig. 31).

OILY LIQUIDS

Oily liquids require a special nebulizer. This is not only suitable for puffing the oil spray into the nasal chambers, but if the mouth is held open it is of sufficient force to drive it through

the naso-pharynx. The same instrument serves for spraying the pharynx. If the rubber ball is strongly compressed and the patient inspires deeply each time, the atomized fluid can also be driven through the nose and drawn into the larynx and trachea.

In young children a few drops of any oily solution can be conveniently trickled into the nostrils from an ordinary pipette, such as the clean filler of a stylographic pen.

The oily solutions, made with liquid paraffin, paroleine, benzoinol, or similar menstrua, can be medicated with sedative, stimulant, or antiseptic drugs (Formulæ 66 to 69). They are sometimes employed as intratracheal injections.*

OINTMENTS

Ointments are only employed in nasal affections, and principally for those close to the anterior nares. A short, thick, camel-hair pencil is twisted in the ointment, and then introduced into the affected nostril. When it reaches the diseased area, the nostril should be compressed from the outside and the pencil withdrawn. This ensures the deposit of the ointment *in situ*. If a small portion is introduced within the nasal vestibule, it can be sniffed in farther and will exert its effect more extensively. This is more noticeable when it contains a volatile body like menthol, or an anæsthetic like cocaine or orthoform. A useful basis is made of 2 drachms of lanoline and 6 drachms of vaseline. It is well to avoid coloured antiseptics (iodol, dermatol, etc.), as they stain the handkerchief. Salol, resorcin, and sozoiolol of soda can be used in the strength of 2 per cent. (Formulæ 74 to 78).

PIGMENTS

The various paints used in affections of the upper air-passages should be applied under full illumination and directly to the required spot. They are sometimes used in too general or haphazard a method; the irritation thus induced may defeat any beneficial action, and in the case of caustics may do more harm than good.

In the **nose** it may first be necessary to retract the soft tissues with a 5 per cent. solution of cocaine, and the diseased area may require cleaning or drying. A small piece of cotton-wool, rolled in a ball the size of a pea, is held at the point of the nasal forceps and, after being dipped in the paint, is placed direct on the diseased spot, where it is left for a few moments or minutes.

When a more extended effect is desired, as in cocainizing the mucous membrane or applying a stimulating paint like Mandl's solution to the inferior turbinals, a larger dossil of cotton-wool is taken in the

* J. W. Gleitsmann, *N.Y. Med. Record*, March 25, 1905.

forceps and brushed backwards and forwards, or left *in situ* for a few minutes.

In the **naso-pharynx** the cotton-wool can be held in a small pair of adenoid forceps (Fig. 188, p. 338), or twisted securely round a suitable carrier (Fig. 50). After soaking it in the liquid ordered, any surplus fluid is squeezed out, the tongue is depressed with one hand, while the other directs the carrier backwards. Once behind the lower border of the soft palate, the cotton-wool extremity is turned quickly upwards before the palate retracts upon it, and is swept over the roof and sides of the space. No force is employed; the soft palate must be pendulous and should not be irritated. The proceeding is facilitated by spraying the soft palate and fauces with a 2-5 per cent. solution of cocaine.

The **pharynx** is the region where pigments are most extensively used. The surface is first freed from mucus, employing an alkaline spray if necessary, and then dried with cotton-wool mops. The paint may be taken up on a pledget of cotton-wool or on a cotton-tipped probe. It is thus supplied to the affected area and gently held in position for some time without irritating the patient. The application may have to be repeated till the desired effect is produced. A common error is to suppose that throat paints should be "rubbed in." This

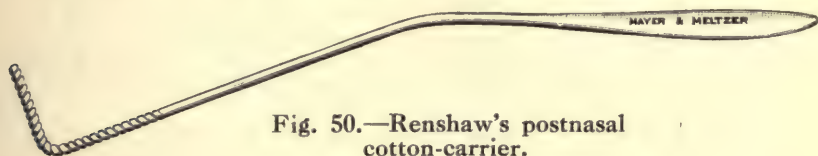


Fig. 50.—Renshaw's postnasal cotton-carrier.

only irritates the pharynx, producing a free flow of mucus and also swallowing movements which prevent any local action of the pigment. When used on the tonsil, the mop should be gently pressed against the upper part (i.e. the entrance to the supratonsillar fossa), so that the paint is squeezed outwards and flows downwards over the tonsillar surface.

In many pharyngeal conditions a pigment can be effectually and pleasantly replaced by a lozenge.

INSUFFLATIONS

Powders can be insufflated into the upper air-passages by different powder-blowers. The Kabierski and De Vilbiss models are convenient for the nose and pharynx, and that of Spiegel is suitable for the postnasal space and larynx (Figs. 51 and 52).

In the nose.—The intact nasal mucous membrane is as intolerant of medicinal powders as of other foreign bodies. Ciliated epithelium expels a small particle of solid matter at the speed of one inch per minute; * its expulsion is hastened by the secretion stimulated in the mucous and lachrymal glands, and sometimes by sneezing. It is therefore probable that sedative or astringent powders when blown

* StClair Thomson and R. T. Hewlett, *Lancet*, Jan. 11, 1896.

into the nose frequently act as irritants and stimulants of secretion, and a better plan is to employ ointments or oily sprays.

When the mucous membrane is abraded or defective, in ulceration, necrosis, chronic suppuration, or after operation, the nose is more

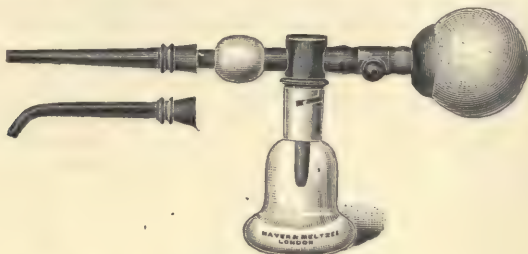


Fig. 51.—Kabierski powder-blower.

tolerant, and powders can then be used with benefit, both for their antiseptic and their stimulant properties.

Method.—The nasal chamber is well illuminated, and the patient is directed to hold his breath for a few seconds, while the part to be treated is coated with a few quick puffs of the insufflator. Immediately afterwards he should expire through the nose. If these directions are omitted the powder is drawn through into the larynx, and produces disagreeable irritation and coughing.

In the pharynx.—Powders are seldom of use in this region, as the free secretion of mucus prevents their direct action, and swallowing movements rapidly carry them away. They are replaced by the employment of lotions, paints, and lozenges.

The roof of the postnasal space is more tolerant of inert substances

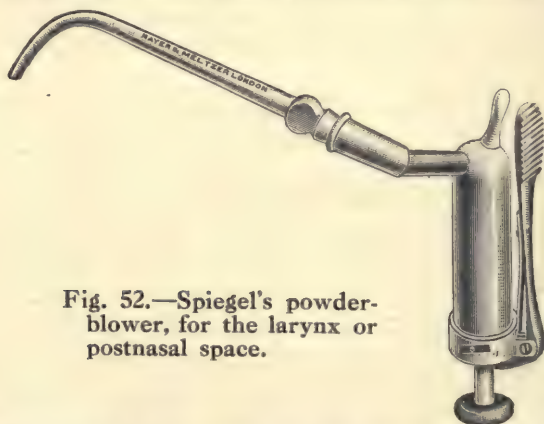


Fig. 52.—Spiegel's powder-blower, for the larynx or postnasal space.

and after operation a blood-clot can frequently be seen adhering to this region and remaining unaltered for days. Antiseptics (iodoform, eucrophen, or iodol) or sedatives (orthoform, anæsthesin, morphine, bismuth) can be insufflated through the nose or from the mouth.

In the larynx.—The larynx is only partly lined with ciliated epithelium, and insufflations are indicated when sedative, analgesic, astringent, or antiseptic effects are desired in the region of the vocal cords or interarytenoid region. In certain cases these effects are better secured by using lozenges or sprays.

Method.—Powders are insufflated into the larynx in the manner described for the use of the spray (p. 61).

With the simple glass tube designed by Leduc, some patients are able to inspire a powder directly into the larynx (Fig. 53). The short end is introduced well back into the pharynx, below the soft palate,

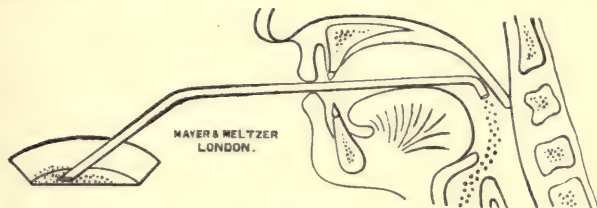


Fig. 53.—Leduc's tube, for inspiring powders into the larynx.

and directed towards the glottis; the other end is held close to a pinch of the powder. With the lips closed lightly round the glass stem, a few quick inspirations are made, and it will be found that the powder is distributed over the cords, ventricular bands, and interarytenoid region.*

TROCHISCI

LOZENGES, PASTILLES, AND COMPRESSED TABLETS

These are chiefly employed for their action in the mouth and pharynx, but, by local absorption, those of a sedative character are beneficial in many laryngeal troubles, while some containing volatile substances, such as menthol, exert an influence even in the nose. Some lozenges take too long to dissolve in the mouth, while others spoil the appetite and upset the digestion; the larger (gr. v) chlorate of potash tablet has been the chief offender from both these points of view. Those of the Pharmacopœia can be broken up so that a small portion is taken at a time. It is better to direct that lozenges be taken after meals.

STEAM INHALATIONS

These are useful in many acute affections of the nose and throat. The patient is directed to pour a pint of steaming, but not boiling, water into a quart jug, and then to add to it a teaspoonful or more of the medicament ordered. The mouth of the jug is covered with

* Dundas Grant, *Journ. of Laryngol.*, xxi., Sept., 1906, p. 420.

a napkin folded into a cone, and the apex of this is left sufficiently open to admit the nose, and through this the patient inspires the medicated vapour. If this is destined only for the nose, as in acute sinusitis, the steam is simply drawn up and down the nostrils. If it is intended to reach the larynx, slow, deep inspirations should be made, about six to eight per minute. Four minutes or more can be spent over each sitting, and repeated every two to four hours, or morning and evening.

A special inhaler may be used, with a thermometer to mark the correct temperature of the water (Fig. 54). This should be 140° F. (60° C.), and this degree is generally approached after water has been brought to boiling-point, poured into a jug, and left there for six minutes before adding the inhalant. If used too near boiling-point, the hot steam may seriously injure an inflamed larynx.



Fig. 54.
Steam inhaler.

For a more prolonged administration, or when the patient is too feeble to sit up and follow the above directions, a Siegle's steam-spray apparatus may be employed.

The "steam tent" is never required. It deprives the patient of fresh air, and poisons him with his own exhalations, while the steam condenses in chilling damp on his face and bedclothes.

DRY INHALATIONS

Such valuable substances as ammonia, carbolic acid, menthol, thymol, iodine, creosote, terebene, eucalyptus, or chloroform, can be conveniently inhaled directly from a bottle, or when sprinkled on a handkerchief or the sponge of a pocket inhaler. For more prolonged use Burney Yeo's respirator can be employed (p. 804).

The nascent fumes of neutral chloride of ammonium from an inhaler are sometimes prescribed for catarrh, particularly when the Eustachian tubes are affected. In other regions of the upper air tract they are of doubtful utility.

Hot air has been recommended in paroxysmal rhinitis and other nasal affections.* It is conveniently supplied from an electric heater.†

* Lermoyez and Mahu, *Ann. des Mal. de l'Oreille*, xxvi., Juillet, 1900, No. 7.
Lermoyez and Mahu, *ibid.*, xxix., Mars, 1903, No. 3.

Lermoyez and Mahu, *Rev. Hebd. de Laryngol.*, 4 Mars, 1905, No. 9, p. 241.
Lichtwitz, *Arch. Internat. de Laryngol.*, xiv., 1901, Nos. 1 and 2, pp. 35 and 103.
J. C. Bick, *Laryngoscope*, xiii., May and July, 1903, pp. 368 and 537.

† Bourgeois, *Ann. des Mal. de l'Oreille*, 1906, No. 3, p. 264.

CAUSTICS

Caustics are frequently required in treating diseases of the nose and throat. Amongst those most generally employed are the galvano-cautery, chromic acid, trichloroacetic acid, nitric acid, acid nitrate of mercury, pure carbolic acid, nitrate of silver, lactic acid, salicylic acid, and chloride of zinc. Long-continued use of nitrate of silver should be avoided, as argyria has resulted from local applications.*

THE GALVANO-CAUTERY

The employment of this convenient form of caustic has been greatly abused, but it is extremely serviceable if a recognition of its method of action is kept in mind.

The current for heating the iridio-platinum points can be obtained from a plunge-battery, an accumulator, or direct from the street current through a suitable adapter, by which it can be utilized for light, cautery, or motor purposes. The electrode employed for the nose is straight and short; for the pharynx it is straight and somewhat longer; while for the naso-pharynx and larynx several sizes, suitably curved, will be required. In most cases the point



Fig. 55.—Cautery-point; shape and size most generally useful.

should be small, as it allows of finer and more precise work (Fig. 55). The large assortment of electrodes frequently sold with a battery are seldom necessary. When an extensive surface requires treatment it is better to apply the cautery to several points, instead of scarring a larger area with a big electrode.

Action.—The galvano-cautery destroys any soft tissue with which it comes in contact. But as this is done by burning, a wound of low vitality is left covered with a slough which forms a suitable septic nidus, and the heat and steam evoked irritate neighbouring tissues. Care must therefore be taken to apply the cautery with due antiseptic precautions; the slough must be watched; and time has to be allowed for it to separate—generally seven to ten days—and for subsequent healing to take place. The reaction produced beyond the cauterized area stimulates fibrosis, which is the desirable result aimed at in causing contraction of chronic hypertrophy of the turbinals or tonsils, or in arresting lupus or tubercle.

* Méneau, *Arch. Internat. de Laryngol.*, xii., 1899, No. 1, p. 31.

But this same action may be harmful if applications are made too extensively, or too deeply, or are repeated at too short intervals.

Employment.—The region to be treated should always be under full illumination. It is anæsthetized with cocaine, and in the nose is rendered more visible by adrenalin. The surface is well mopped with cotton-wool, so as to dry it and limit the production of irritating steam. The current is then turned on until the point glows with a cherry-red heat. If a white heat is used, the point will cut the tissues instead of cauterizing them, and may thus cause annoying hæmorrhage. If only a dull heat is produced, the electrode will adhere closely to the burnt surface, and then cause pain and bleeding when detached. This regulation of the cautery-point should not be carried out under the observation of the patient, as the sight of the glowing metal would needlessly alarm him. The cold cautery is first applied to the mucous surface, and the patient is asked if he feels it. If he replies in the affirmative, a second application of cocaine is made, and time is allowed for it to act. Once the surface is quite benumbed, the point is introduced until nearly in contact, the current is switched on by pressing the button on the handle, and the glowing point is swept along the surface or pushed into the tissue, according to the case. When the application is completed, the point is withdrawn from the tissues before the current is interrupted, otherwise the chilled electrode would adhere to the charred surface. If this does occur, the point should not be forcibly removed; by turning on the current again for a moment the point becomes free, and the pain and bleeding which would be caused by detaching the eschar are avoided.

After-treatment.—In the nose, the surface may be dusted with orthoform or europen from a powder-blower, or an oily spray or menthol ointment may be used till the surface heals. For the pharynx, an antiseptic or soothing lozenge (Formulæ 42 to 44) can be prescribed, and any pain or reaction is relieved by sucking ice. Similar treatment is used in the larynx.

Precautions.—In the *nose*, it is a good rule not to apply the galvano-cautery to the middle turbinal region. Meningitis has followed this simple procedure, possibly from thrombosis of the ethmoidal veins (Fig. 124), or from traumatic irritation of unsuspected septic foci of suppuration (*see* p. 253). Acute otitis media, acute tonsillitis, erysipelas, and eye affections have followed cauterization of other regions in the nose; doubtless the traumatism had diminished local resistance and facilitated the evolution of latent, local septic conditions. Dry rhinitis may follow excessive or unsuitable use of the cautery. Adhesions between the septum

and the outer nasal wall may be caused when opposing surfaces are charred.

In the *pharynx*, care should be taken that the soft palate does not suddenly descend on the hot barrel of the electrode, and that the patient does not start backwards and injure the tongue and lips. A troublesome dry pharyngitis is sometimes left when the cautery has been too freely used in such conditions as granular pharyngitis, or unsuitably employed, as in sensory neuroses. When applied to the tonsils, care has to be taken not to burn the faucial pillars, and so cause adhesions.

It was formerly held that in the *larynx* the use of the electric cautery is attended with the risk of acute traumatic cedema. This accident is generally due to want of sufficient care and skill. Still, it is well that little should be done at the first sitting, until the tolerance of the patient can be judged. Complete anæsthesia of the larynx, with the pharyngeal reflexes thoroughly under control, is required, so that the cautery-point can be applied under full illumination. Charring of healthy parts may occur if the larynx suddenly contracts and grips the heated electrode.

CHEMICAL CAUSTICS

Chromic acid will frequently serve as well as the galvano-cautery, and in some cases is preferable. It can be used in solutions of the strength of 10 or 20 gr. to the ounce, in a saturated solution, or the dry crystals may be fused on a probe. The end of the probe is warmed in the flame of a spirit-lamp and dipped into the crystals, when a few will adhere. The part of the probe just beyond is next warmed; the heat of the metal will cause the crystals to melt, and, on cooling, to adhere closely in a red coating. If the crystals themselves are passed through the flame, they are apt to be reduced to a black ash which has no caustic action.

In addition to the precautions required with the galvano-cautery, care is taken that no excess of the liquid is used or that the fused acid is not detached. If the yellow staining of the chromic acid is seen to extend beyond the desired area, it is wiped away with moist cotton mops, or neutralized with a solution of bicarbonate of soda (gr. xxx to ̄i).

Trichloroacetic acid may also be used on the end of a probe, but the crystals are difficult to preserve without deliquescence. The end of the probe can then be very lightly dipped in the liquid and passed over the surface to be cauterized. If this has been well dried beforehand, the acid will not diffuse far—otherwise its action must be neutralized with an alkaline solution,

Trichloroacetic acid produces a white eschar. Its action is more superficial and less effective than that of the cautery or of chromic acid.

Nitric acid and *acid nitrate of mercury* are sometimes used in malignant septic conditions, as in acute syphilis or the phagedænic pharyngitis of specific fevers. They can be taken up on the end of a glass rod, but it is safer to use a wooden probe, when there is less risk of the acid dripping off.

Pure *carbolic acid* is a caustic as well as an antiseptic; it causes no pain when applied to a limited area of the mucous membrane, but, on the contrary, has a valuable anæsthetic action. It is used by slightly moistening the end of a probe.

Nitrate of silver is employed in solutions of various strengths, or the crystals are fused on the end of a probe. Any accidental excess is neutralized by using a solution of common salt. The inconvenience caused by the staining properties of nitrate of silver, and the remote risk of argyria, can in some cases be avoided by employing some of the proteid substitutes—collargol or argyrol.

Lactic acid, salicylic acid, and chloride of zinc will be referred to in the chapters where their use is indicated.

HEAT, COLD, AND REST

In acute affections of the nasal accessory sinuses, **heat** is very comforting, and can be applied by the patient wrapping up the head in a woollen shawl, while hot fomentations, or Leiter's tubes, are applied over the affected cavity. Brünings' electric-light head-bath is still more convenient. It is sometimes simpler for the patient to lie with the inflamed side on a rubber hot-water bottle, or to hold a Japanese hand-warmer (*instra*) to the face.

In acute affections of the pharynx and larynx, heat can be applied in the same way, or by a thin, well-spread linseed poultice. In subacute conditions a large mass of cotton-wool may be placed below the angle of each jaw, and fixed in position by a handkerchief tied over the vertex. This also secures both support and rest for the parts.

Cold is less frequently indicated. It can be employed externally in the form of evaporating lotions, iced compresses, or Leiter's tubes. Iced drinks and cold food are frequently useful in throat diseases, or after operation. A most valuable use of cold is in the arrest of hæmorrhage after operation (p. 84).

Physiological **rest** to the nose is secured in acute affections by the complete obstruction which often ensues, and doubtless in many cases this should be respected. Rest to the nasal mucosa

is secured when we pack the nose, or partially occlude it. In the pharynx the instinct of the patient impels him to avoid deglutition in many acute painful affections. When such affections are of temporary duration, there is no gain in opposing this feeling. In malignant disease of the œsophagus requiring a gastrostomy, local relief, and even some recovered power of swallowing, may follow the local rest obtained by this operation. The rest obtained by more or less complete silence is often of marked value in laryngeal disease, and will be referred to later on. Similar benefit to the larynx is frequently noticeable after tracheotomy.

LOCAL ANÆSTHESIA : COCAINE

There is no department of practice in which the services of cocaine are so often required as in rhinology and laryngology, so that it seems desirable to give some special consideration to the properties, methods of use, indications, and dangers of this drug.

Cocaine is employed in the form of its most useful salt, the hydrochloride of cocaine. This is soluble in water, glycerine, and alcohol.

Action.—Cocaine produces both local and general effects.

Locally cocaine is (a) an anæsthetic, (b) a powerful vaso-constrictor, and, consequently, (c) produces local anæmia. The insensibility is more complete the more perfect the contact between the drug and the nerve-endings, and therefore it is more thoroughly produced when it is used on mucous membranes which are thin and richly supplied with nerve-endings. It is for this reason that local anæsthesia can be more readily induced in the nose than in the pharynx or larynx.

The two other local actions are as important as the first, for, by retracting the tissues and reducing the hæmorrhage, cocaine facilitates examination and operation. These results are followed by a secondary vaso-motor congestion, and as this sets in the anæsthesia passes off.

The *general* effect of cocaine—which is manifested even when topically applied to a mucous membrane—is first felt by a pleasurable sensation as of a slight degree of alcoholic intoxication. There is as a rule a feeling of cheerfulness and lightness, manifested by vivacity and loquacity on the part of the patient. When the dose absorbed is slight the general symptoms may stop at this point. If the intoxication is more decided, the patient becomes pale, cold, faint and giddy, complains of nausea, and breaks out in perspiration. The pulse is small and quick, increasing rapidly to 140. The pupils may dilate and cease to react when the light from the frontal mirror is reflected on them. This is a sign of deeper intoxication. In some cases, without apparently passing through the stage of excitement, the patient passes into a condition of abnormal calm, and the first thing that may be noticed the matter is that he is sitting in a limp and apathetic manner, observing nothing and making no resistance to the manipulations to which he may be submitted, until, in some instances, he falls forwards in a dazed and semi-conscious condition.

These effects may pass off in a few minutes, or may last some hours.

In other instances they continue for days, during which the patient is able to remain in the horizontal position with comparative comfort, or complaining only of some faintness, but on raising himself is seized with faintness, vertigo, nausea and vomiting. The face is pale and clammy. The pupil is frequently dilated. There is insomnia. The pulse is quick, and there is a sense of cardiac discomfort.

Acute intoxication.—In the most serious form of cocaine intoxication death may take place within an hour. The patient passes from the condition already described into one of unconsciousness. The respiration is irregular, deep and spasmodic; the heart-beats are hurried and irregular; and the pupils widely dilated and inactive. Convulsions set in, being at first tonic and then clonic, as in epilepsy; and respiration ceases with the diaphragm in contraction, while the heart stops in systole.

It is important to distinguish between a simple sensation of faintness and cocaine poisoning. Of course the two may occur together.

Chronic intoxication.—There is also a chronic form of cocaine poisoning, due to the repeated use of the drug in small or slowly increasing quantities. It is therefore safer not to give it in prescriptions to patients. By this precaution we are not depriving the patients of any benefit, for the drug has few therapeutic indications beyond its services for purposes of examination and local treatment, except as a sedative in such hopeless conditions as advanced malignant or tuberculous disease of the throat.

The habit of self-drugging with cocaine may have originated in a desire for the local relief secured by applying it to the mucous membrane of the nose. The patient finds the anaesthesia obtained grateful in many irritable conditions of the nasal fossae, while the vaso-constrictor effects give relief by restoring or increasing the patency of the nose. Unfortunately, as already pointed out, this constrictor action is followed by one of dilatation and engorgement, and if relief is sought by continued applications the constricting effect becomes merged in one of chronic vaso-motor paresis, and the last state of the patient is much worse than the first. It is to cocaine that many of the quack cures for hay-fever and asthma owe both their reputation and their evil after-effects. Those who have employed the drug in this way frequently present themselves with a form of chronic hypertrophic rhinitis, in which the inferior turbinates are large, pale, insensitive and boggy; and in these cases the practitioner would often fail to effect a cure unless he were on his guard to detect and eliminate the chief cause—the cocaine.

But in addition to those who drug themselves with cocaine for purely local conditions, there are others who use it habitually for its stimulating mental effects alone. This leads to peevishness, irritability, restlessness, loss of self-control, and a deterioration of character similar to that induced by morphia.

This form of cocaine mania appears to be more frequently met with in France and America than in the United Kingdom.

Treatment of cocaine intoxication.—On the first indications of faintness from cocaine the head should be lowered to the level of, or below, the patient's knees. Better still, he should be placed in the horizontal position, with the clothes round the neck

loosened, and allowed to sip a glass of water with some sal-volatile or brandy. Strong smelling-salts may be held to the nostrils. Meantime the windows are thrown wide open; and if it happens that the patient has not had any food for some time, a little strong black coffee can be prepared.

In the milder cases, and in nearly all those where the proper prophylactic measures have been taken, these remedies will be found quite sufficient. But as a certain amount of faint-feeling remains for some hours, no further examination or treatment should take place that day, and at the next visit greater precaution should be taken in employing the drug.

In the severe forms of cocaine poisoning we may give an inhalation of 3 to 5 drops of nitrite of amyl, which can always be conveniently kept at hand in hermetically closed glass capsules. It restores the colour to the face, and diminishes the arterial tension, but its effect is transitory. The same may be said of trinitrin, which can also be kept at hand in the form of chocolate tablets containing $\frac{1}{100}$ gr. each. More permanent results can be obtained by a hypodermic injection of $\frac{1}{4}$ to $\frac{1}{2}$ gr. of hydrochlorate of morphia, or by the administration, by the mouth or rectum, of chloral, which is a still more marked physiological antidote of cocaine. The tetanic contraction of the diaphragm is warded off by the inhalations of chloroform, while the heart is stimulated by alcohol and hypodermic injections of caffeine, ether, or strychnine. Breathing may have to be maintained by artificial respiration, or by Laborde's method of rhythmic traction on the tongue. Throughout the treatment—which should be continued perseveringly and never despaired of—the patient must be kept strictly horizontal, with the head low and the extremities warmed, and he must not be depressed by an exhibition of alarm on the part of those around him.

Prophylaxis.—Patients who are anæmic, fatigued, or fasting are apt to suffer from the general effects produced by the absorption of cocaine. Children are particularly susceptible. It is a good rule to avoid using it in patients under the age of 6, and not to employ it as a routine of practice except in those over 12.

Women, especially if pregnant or nursing, are more susceptible to the drug than are men. It should be used with the greatest circumspection, particularly on a first occasion, in those who show any dread of the drug or of the local measures associated with it. Those who are frightened, nervous, hysterical, or excitable show special predisposition to its effects.

In elderly subjects it should be used with great care, and it is only exceptionally that it should be tried in those with cardiac

affections, while angina pectoris is an absolute contra-indication. The cachectic might naturally be thought to be more susceptible to it, but it is curious that—at least in those who are gradually accustomed to it—its local benefits are frequently well manifested in advanced malignant and tubercular disease, while the drawbacks from its general action are rarely noticeable. These latter are, indeed, more apt to be observed in patients with emphysema, or diminished respiratory capacity from other causes.

Certain subjects possess a peculiar susceptibility to the general effects of cocaine, and as it is impossible always to foresee who will manifest this intolerance, the wisest plan is invariably, when employing it on a patient for the first time, to use tentatively a very small quantity of the drug and carefully watch the result. If no bad effects appear, in a few minutes the dose can be increased, and on future occasions the larger quantity can be used at once.

The occurrence of the general effects will also vary in some degree according to the part of the air-tract to which it is applied. Thus the tympanic cavity presents an extreme degree of susceptibility, while the nose absorbs the drug more readily than either the pharynx or the larynx. In each of these regions the appearance of poisonous symptoms will also to some extent depend, amongst other things, on the care taken to avoid any of the drug being swallowed. The general effects can be largely avoided by attention to the methods of applying the cocaine, described later on.

Poisonous dose.—It is difficult to settle what is the quantity of cocaine which should not be exceeded in local applications, first, because of the uncertainties depending on age, sex, and idiosyncrasy, and secondly, because in those cases where dangerous symptoms have manifested themselves the amount of solution has seldom been ascertainable, although the strength has generally been noticed. The tolerance for the drug varies not only with each individual, but also with different parts of the body. Thus the application of 0·04 grm. ($=\frac{2}{5}$ gr.) of cocaine to the conjunctiva has caused death, while in another case 1 grm. ($=15$ gr.) has been swallowed with dangerous symptoms but with recovery.* Three grains injected into the urethra have proved fatal.† Fatal results have been produced by the application to the nose of 4 gr. of cocaine, and alarming conditions have been brought about by a much smaller quantity; and some authorities advise that a local dose of 1 gr. should never be exceeded in the nose, and that 2 gr. in the

* G. Frey, *Ann. des Mal. de l'Oreille*, xxxiii., 1897, No. 3, p. 222.

† C. B. F. Tivy, *Brit. Med. Journ.*, Oct. 6, 1906, p. 868.

pharynx and larynx is without risk, and will produce a satisfactory anæsthesia. This dosage can be easily regulated by using the compressed tablets containing 1 gr. each of cocaine. With these at hand a fresh solution can be prepared on each occasion, and the exact amount of drug used is known. One tablet dissolved in 20 drops of boiled water will make a solution of 5 per cent., enough for a first examination. Once the tolerance of the patient has been tested we can use 5-gr. tablets, dissolving one in 50 minims to make a 10 per cent. solution. With the precautions already indicated, however, and with solutions prepared and used in the manner described farther on, this precaution with regard to exact dosage is almost superfluous, except when using it on patients for the first time, or in very sensitive subjects.

Strength of solutions.—The solutions of cocaine vary from 1 to 20 per cent. The feebler strengths are used in sprays and simply when it is required to soothe a hypersensitive condition of the tongue or pharynx. The strongest preparation, that of 20 per cent., is seldom wanted except for operations on the larynx. Some observers are of opinion that there is not only more local effect from a strong solution, but that the amount which is absorbed is much less. Still, for all ordinary purposes it may be safer to use a solution of 10 per cent., which is also enough to produce a sufficient anæsthesia.

Preparation of solutions.—Solutions have the drawback that they cannot be sterilized without decomposing the salt, and they decompose quickly. In such a short space of time as three days alterations take place, and not only are the anæsthetic properties of the drug diminished but toxic products are evolved. The solution becomes turbid, algæ form, and the salt crystallizes round the neck of the bottle. For practitioners who do not require to make almost daily use of cocaine, the employment of it in the tablet form already mentioned will prove the most satisfactory. For those who require to keep a solution ready made for frequent use, it can be preserved by adding to each ounce of solution a little salicylic acid, resorcin, or thymol (*see* Formulæ 1 and 2).

Methods of use.—A small region can be anæsthetized by placing a few crystals of the cocaine on the spot, where they are dissolved by the mucus. For all ordinary purposes it is better to be provided with a solution which can be used as a paint or spray, or injected endermically.

In the nose a 2-5 per cent. solution may be sprayed into narrow nostrils to facilitate examination. Then pledgets of cotton-wool or pieces of 1-in. ribbon gauze, about $1\frac{1}{2}$ in. in length, are moistened with a 10 per cent. solution and placed in direct

contact with the part to be operated on. The addition of a little suprarenal extract will not only facilitate examination and treatment by its hæmostatic action, but, for the same reason, will tend to prevent absorption of cocaine and its toxic effects. It is not sufficient to "pack the nose" loosely with a strip of moistened gauze; the mucous surface must be closely coated over with pieces well saturated with the solution of cocaine and adrenalin, which thus comes into direct and prolonged contact with the lining of the nose. At least twenty minutes are required to secure satisfactory anæsthesia, and if it is not found to be complete at the end of that time a second application is made. If the strips of moistened gauze are left *in situ* for even an hour it will be found that anæsthesia is not only maintained but more complete.

Meanwhile the patient should hang his head forwards, so that superfluous solution may not run into the naso-pharynx and get swallowed. If this does occur, and he is alarmed at the sensation of a lump in the throat, he can be assured that the sensation will pass away in twenty minutes.

The pharynx, for examination, can be sprayed in the same way, the patient being encouraged to hold the cocaine solution in the throat for a minute, and then spit it out. For topical treatment, either in the pharynx or naso-pharynx, the exact region is dabbed several times with a 10 per cent. solution.

Regional anæsthesia by "nerve-blocking" by injection of novocain is now largely employed in rhino-laryngology* (cf. p. 778), and in patients very susceptible to cocaine nerve-trunk "blocking" can be brought about in the nerve by depositing a single drop of saturated solution of the drug under the posterior tip of the middle turbinal, and another drop high up on the septum in front. After fifteen minutes there will be numbing of the sensory supply from the sphenopalatine ganglion and the internal nasal nerve.†

The larynx seldom requires cocainizing for examination; it is only the irritability of the pharynx which has to be overcome. This is done by spraying the palate, fauces, base of the tongue, and pharynx with a 5-10 per cent. solution of cocaine. To prepare the larynx for operative treatment the usual cocaine-adrenalin solution is trickled in drops out of a laryngeal syringe (Fig. 26r, p. 592) on to the epiglottis, the arytenoids, the ventricular bands,

* J. Broeckaert, *Journ. of Laryngol.*, xxvii., 1912, No. 10, p. 524.

H. Luc, *Soc. Franç. d'Oto-laryngol.*, 1912, and *Ann. des Mal. de l'Oreille* xxxviii., 1912, No. 5, p. 441.

J. Le Mée, *Ann. des Mal. de l'Oreille*, xxxviii., 1912, No. 9, p. 229.

† Greenfield Sluder, *Laryngoscope*, xxiii., 1913, No. 11, p. 1078.

the interarytenoid region, and finally on to the cords themselves, while the patient sounds a long *E*. The stronger 20 per cent. solution of cocaine may be required, and is best rubbed into the required area with a cotton-tipped laryngeal probe or a brush. The brush is more suitable for anæsthetizing the sinus pyriformis and back of the cricoid cartilage, as is required for œsophagoscopy. In any case the patient is encouraged to spit out the solution rather than swallow it, thus avoiding toxic symptoms.

"Nerve-blocking" the larynx, or anæsthesia of the superior laryngeal nerve.—This method is available in certain very irritable larynges, or when there is laryngitis, or when the surface anæsthesia is not sufficient for deep galvano-cautery, and, particularly, when it is necessary to numb the larynx against the dysphagia of tubercular laryngitis (p. 649). This latter result was formerly secured by the injection of alcohol around the superior laryngeal nerves, and now uniformly satisfactory results are claimed by improved technique and the use of novocain.*

Method.—The patient lies on his back with the head well extended. The needle should be sharp and $2\frac{1}{2}$ in. long. The fluid used is a 5 per cent. watery solution of novocain, with the addition of a few drops of adrenalin; 20–30 minims of this may be injected into each side. For safety, the large vessels may be pressed back with the thumb and forefinger out of danger.

A preliminary injection of morphine and atropine is advisable; the fauces may be sprayed as described. To reach the superior laryngeal nerve some observers try to strike it as it lies on the thyro-hyoid membrane and before it pierces that structure. As this point is difficult to reach, and as the needle is apt to traverse it and pour the solution into the sinus pyriformis, the following plan is advised. The needle is entered so as to strike the great cornu of the hyoid, one inch behind the lesser cornu. The needle point is now slightly depressed so that it hitches against the lower border of the great cornu. Here the needle comes in relation with the area of the thyro-hyoid membrane, which is directly under the skin of the neck (Fig. 56), and can be directed downwards and forwards inside the thyroid cartilage while the solution is injected along an inch or more of the nerve. A reference to Fig. 58 will show that the internal laryngeal nerve, in the latter part of its course, is only separated by mucous membrane from the cavity of the sinus pyriformis. This space is also avoided by remembering that it may reach forward to $1\frac{1}{4}$ in. (in the male) or $\frac{3}{4}$ in. (in the female) from the middle line (Fig. 57).

* Courtenay Yorke, *Brit. Med. Journ.*, June 13, 1914, pp. 1290–91. (The description given in the text is based on the technique described in this article.)

Submucous and endermic injection of cocaine.—Great caution is necessary in making intercellular injection of cocaine, as the drug is intensely toxic in this form, and, fortunately, only a small dose is required. It is a good rule never to exceed 1 cg. ($\frac{1}{6}$ gr.) of the salt. As the hæmostatic effect of suprarenal-gland



Fig. 56.—Surgical anatomy of region concerned in anæsthetizing superior laryngeal nerve.

A, Internal laryngeal nerve; B, joint where needle strikes the great cornu of the hyoid bone; C, small cornu of hyoid bone; D, bare area of the thyro-hyoid membrane; E indicates line followed by the needle during injection, (Courtenay Yorke.)

extract is required at the same time, the two are combined; $\frac{1}{6}$ gr. of cocaine, 2 drops of adrenalin, $\frac{1}{5}$ gr. of sodium chloride, and $\frac{1}{50}$ gr. of morphia are dissolved in 60 minims or more of sterilized water, and slowly injected beneath the mucosa of the Schneiderian membrane in operations on the septum, or into the true skin for such

operations as tracheotomy. At least twenty minutes must elapse to secure full effects. Better than cocaine, as being less toxic, is eucaine, which can be kept in a ready and portable form in small glass ampoules in the dose of $\frac{1}{8}$ gr., with $\frac{1}{2000}$ gr. of adrenalin, in 1 c.c. (16·9 minims) of isotonic solution ("eudrenine") (cf. p. 777 and Fig. 322).

A preliminary hypodermic of morphia (gr. $\frac{1}{8}$ – $\frac{1}{4}$) and atropine is helpful in many cases of operation under local anæsthesia. It lessens reflex irritability and calms the patient.

Substitutes for cocaine. — **Eucaine** may be employed instead of cocaine in patients who show marked susceptibility to the latter drug. The lactate of eucaine is freely soluble, and a 20 per cent. solution can be prepared with cold water. It is slower in its action than cocaine; the anæsthesia (when applied to the surface) is not so complete, and its vaso-constrictor action is slight. The latter defect can be compensated by the addition of a suprarenal extract. Owing to its very slight toxic effect it is more suitable than cocaine for infiltration anæsthesia (*see* p. 776).

Alypin, in doses approximately the same as for cocaine, has been used as a substitute in endermic injection.

Stovaine is claimed to be only half as toxic as cocaine, and to be equally effective in solutions half as strong.* The absence of vaso-constrictor action makes it a less suitable drug in this department of practice.

Novocain promises to be the best substitute for cocaine. Over the latter drug it has the advantage that its solutions keep without

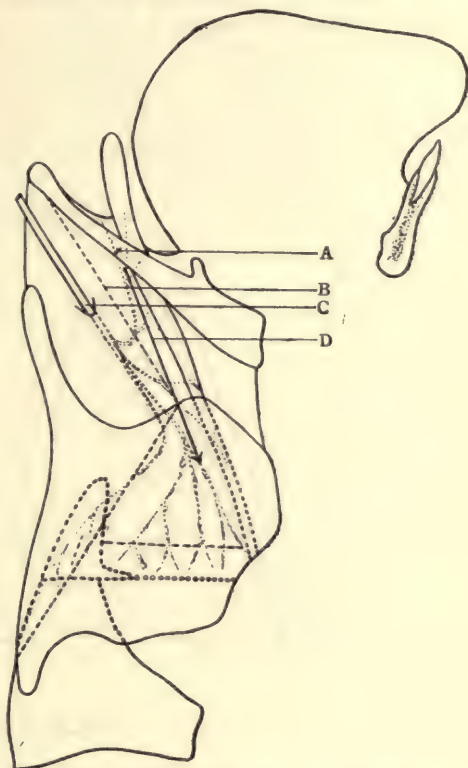


Fig. 57.—Anæsthetizing the superior laryngeal nerve.

A, Point where needle strikes the great cornu of the hyoid bone; B, line indicating anterior limit of the sinus pyramidalis; C, internal laryngeal nerve; D, line followed by the needle during injection. (Courtenay Yorke.)

* *Brit. Med. Journ.*, 1906.

deterioration and can be readily sterilized. It is said to be six times less toxic than cocaine, and to act more quickly and produce an equal degree and longer duration of anæsthesia. Novocain is applied to the mucous membrane in solutions of the same strength as indicated for cocaine. For infiltration anæsthesia, 0.125 grm. is employed, dissolved in 25 c.c. of normal salt solution to which suprarenal extract can be added. Novocain-suprarenin tablets contain $\frac{1}{2}$ gr. of novocain. One or two are dissolved in 33 minims of hot water, to make a 1 or a 2 per cent. solution. As many as three tablets (1 gr. novocain) may be used at one sitting.* I find that novocain is not so effective as cocaine for surface application, but it may serve as a substitute where the latter drug is contra-indicated, particularly in elderly subjects.

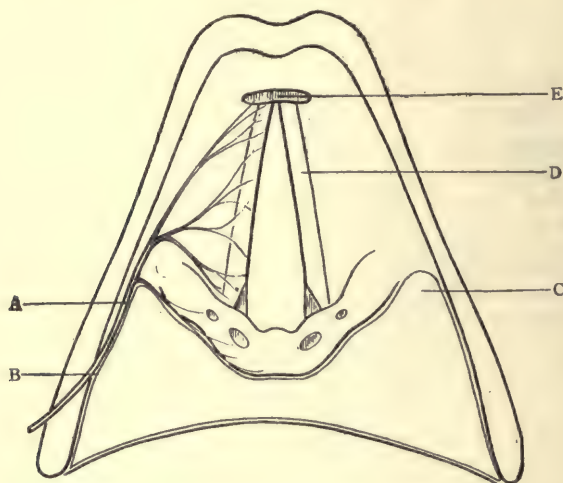


Fig. 58.—Anæsthetizing the larynx.

A, Internal laryngeal nerve; B, mucous membrane of the pharynx; C, sinus pyriformis; D, vocal cords; E, epiglottis. (Courtenay Yorke.)

For submucous or hypodermic injection it acts well, and can be employed much more freely and safely than cocaine.

Cocaine, alypin, and stovaine are precipitated by sodium carbonate and by borax, but novocain is compatible with these substances and with potassium iodide.

Orthoform. Anæsthesin.—These non-toxic powders are used for producing some local anæsthesia on mucous surfaces. They may be used to mitigate the discomfort after operations on the air-passages, in removal of tonsils, cauterization of the nose or pharynx, and are particularly useful in soothing the dysphagia of tubercular laryngitis or other diseases. It is doubtful if they will act through unbroken epithelium.

* J. W. Pare, *Brit. Med. Journ.*, May 18, 1907.

LOCAL ISCHÆMIA: SUPRARENAL-GLAND EXTRACT

The extract of the suprarenal gland is available under various names—adrenalin, adrenine, adrin, perinephrin, epinephrin, hæmostasine, hemesine, vaso-constrictine, suprarenalin, suprarenin, epirenin, paranephrin, adnephrin, renaglandin, renostypticin, etc. These liquids are generally of the strength of 1 in 1,000, and can be used pure on mucous surfaces. But they can be diluted with normal saline solution, solutions of cocaine, or other drugs. If kept in well-stoppered tinted glass bottles, the solution can be preserved for at least several weeks. The solid extract is useful for those who only occasionally employ it, and in this form it is conveniently made up with cocaine or eucaine, so that solutions of the desired strength are prepared as required.

Applied to a mucous surface, adrenalin produces a local ischæmia by contracting the blood-vessels, so that the surface becomes pale and shrunken. At the end of fifteen to twenty minutes the surface is bloodless, and can be incised without the loss of more than a few drops of blood. This action is particularly useful in the nose, as the field of operation is enlarged by the constricting action, and is not obscured by hæmorrhage. This vaso-constrictor action is followed by a stage of dilatation, disposing to secondary hæmorrhage, which, according to some authors, may be "violent and sometimes serious." * Adrenalin has no anæsthetic power, but its constricting action lessens the tendency of cocaine to be deeply absorbed, and thus increases the local effect of that drug, and allows of a weaker solution being employed.

An occasional secondary result of adrenalin is that in certain individuals it produces a very irritating rhinitis, lasting from twenty-four to forty-eight hours. It is therefore of doubtful value as a remedy in catarrhal affections, and should only be employed when guarded with cocaine.

Uses.—The great value of adrenalin lies in its power to check hæmorrhage, and so allow practically bloodless operations to be performed in the nose.

Used endermically, with novocain or eucaine, a tracheotomy is not only painless but frequently bloodless. Bleeding areas in the nose or throat can be rendered ischæmic, so that the exact point of hæmorrhage can be detected. The same property will throw into relief lupous infiltrations in mucous surfaces, and in operations for removal of malignant growths will help to define the area of infiltration.†

The addition of a small quantity of adrenalin to a cocaine solution mitigates the toxic tendency of the latter; and its use appears to check a tendency to collapse, either from shock or chloroform, during serious operations on the upper air-passages. But

* C. A. Parker, "Diseases of the Nose and Throat," p. 63. London, 1906.

† StClair Thomson, *Journ. of Laryngol.*, xxii., Aug., 1907, No. 8.

it is of vital importance to bear in mind that these remarks all apply to adrenalin when employed superficially on mucous surfaces. Several deaths have followed on the submucous or subcutaneous injection of adrenalin in patients who were then submitted to a general anæsthetic.

Methods.—Adrenalin is employed in the same ways as cocaine. A partial result may be obtained in five minutes, but its full ischæmic effect is only secured at the end of twenty minutes. If a pledget of cotton, soaked in cocaine and adrenalin, is left *in situ* for even an hour, the anæsthesia and ischæmia will still be fully maintained, and will last for two or three hours.

For secondary hæmorrhage after adrenalin, *see* p. 784.

CHAPTER IV

SPECIAL CONDITIONS AND DANGERS OF OPERATIONS

IN the performance and after-treatment of operations on the nose and throat, there are special conditions and dangers to be considered and guarded against. These are increased when a general anæsthetic is required. This is administered through the one narrow natural orifice in which the operator has to work, while at the same time it is kept clear of blood and mucus for the patient to breathe, swallow, and possibly vomit.

Bleeding cannot be controlled as easily and directly as in the operations of general surgery, and there is always the risk of blood passing into the lower air-passages. The field of operation can never be rendered sterile, and in many cases is particularly septic. Wounds through the mucous membrane cannot be protected with dressings in the usual way; so that the local methods of repair require particular study. Shock has certain features to be borne in mind, and certain possibilities of septic infection have to be provided for. These several points will now be considered more fully.

Hæmorrhage.—This is apt not only to be more free, but also more serious, in young children and in patients over 60. The tendency is increased with menstruation or pregnancy, while hæmophilia adds a grave danger.

In the nose, the vascular turbinals bleed freely; a small varicose vessel on the septum is the commonest source of epistaxis—often very copious; vascular growths are met with, and malignant ones are apt to bleed profusely. Secondary hæmorrhage may occur between the third and eighth day after operation, when clots or crusts become detached.

In the naso-pharynx, where bleeding surfaces are still more remote, hæmorrhage from such growths as adenoid vegetations is generally very sharp, though of short duration, while from naso-pharyngeal fibromata it is apt to be copious and almost uncontrollable.

In the pharynx, the proximity of large vascular trunks, with

possible aberrant branches, demands caution. The special dangers of hæmorrhage in the course of tonsillotomy will be dealt with later on.

In the larynx, hæmorrhage is seldom serious in operations carried out through the mouth. That occurring in external operations requires special precautions.

Prevention and arrest of local hæmorrhage.—The patient should be more carefully prepared than usual for an operation. Hæmophilia should be inquired into, and, if there is any suspicion of it, lactate of calcium may be administered for three days beforehand, in doses of 10 to 30 gr. twice a day. If the patient is an undoubted hæmophilic, any operation should be avoided if possible. It is well to abandon the use of alcohol and tobacco for at least three days beforehand. When the operation can be carried out in the home or the hospital where the patient has slept, and if he can remain there afterwards, many risks are avoided.

In all cases, unless the hæmorrhage is serious, it is well not to be too precipitate in efforts to arrest it. Such attempts, by stimulating the patient, detaching blood-clots, or exciting reflexes, may even maintain it. The clothing should be loose, the operating room should be well aired and cool, and ice-water should always be at hand. If freely sluiced over the face, behind the ears, and round the neck, cold water has such a remarkable reflex vaso-constrictor action that it alone is sufficient to arrest hæmorrhage in the majority of nose and throat operations. Its stimulating effect on the respiration and circulation is always agreeable to the patient, and may be very valuable when he is under a general anæsthetic. Adrenalin will control bleeding in many cases (p. 81).

In the nose.—If the operation is performed under a local anæsthetic, the patient's head should be inclined forwards, so that the blood can drip from the nose. The first-formed clots may be expelled; but afterwards the patient should avoid sniffing or nose-blowing, and should sit with the head forward, and the nostrils closed with his thumb and forefinger. Ten to fifteen minutes in this position will arrest most cases of epistaxis. A slight oozing of blood may be expected to go on for a few hours in certain cases. If the bleeding persists, ice should be applied externally and held in the mouth, the nose may be syringed with very cold or with very warm salt and water (3i to a pint), and the horizontal position assumed. If this fails, a pledget of cotton-wool is dipped in peroxide of hydrogen (5 vols.), or perhydrol (3 per cent.), and introduced into the bleeding nostril. This may be repeated more than once, the patient lying on his side, face downwards, and pinching both nostrils. If a galvano-cautery is

available, and the bleeding comes from a limited and visible point, it can be sealed with a touch of the electrode (cf. p. 68).

If these methods fail, plugging must be resorted to. With the nasal speculum and good illumination, the bleeding area is cleansed with cocaine and adrenalin and a strip of one-inch ribbon gauze is carefully packed on to the spot, the end being left just within the vestibule, so that the patient can remove it for himself at the end of twelve or twenty-four hours. It is better to use a single strip of gauze, instead of cotton-wool, as portions of the latter might be detached and left behind. If there is fear of the gauze strip becoming adherent, it can be smeared with sterilized vaseline beforehand.

Postnasal plugging.—If the bleeding comes from far back in the nose it may become necessary to plug the postnasal space. A purified sponge is squeezed very dry, compressed to the size of a walnut, and tied round its centre with a piece of tape, leaving two free ends of about twelve inches in length. A soft rubber catheter is passed along the floor of the nose till it appears below the soft palate, when the end is seized with forceps and drawn through the mouth. To this one of the tapes is made fast, so that when the catheter is withdrawn from the nose, the sponge is pulled up into the postnasal space. The two tapes are tied together over the upper lip. The anterior part of the nostril can then be packed with gauze, if necessary. If the patient is under chloroform, one tape can be dispensed with; the soft palate is simply held forwards with the forefinger of the left hand, or a palate retractor, while the other hand passes the compressed sponge up into the naso-pharyngeal space, and tucks it well into the posterior choana on the affected side. A second tethered sponge can then be introduced through the mouth and packed into the other choana. Two separate sponges, used in this way, are more certain and much less uncomfortable than the old method of stuffing a single sponge as large as a Tangerine orange up into the postnasal space. Although often effective, this latter plan left the plug astride the posterior margin of the septum, which prevented it from fitting in to each choana. The sponge pushed the soft palate downwards, interfering considerably with breathing and swallowing, producing much pain, and leaving the patient with a bruised and aching soft palate for days afterwards. The single large sponge tampon, about the size of a small orange, should therefore be reserved for cases where the bleeding comes from the walls of the naso-pharynx itself.

Plugs in the nose should be avoided, if possible. They are painful, interfere with repair, prevent drainage, and may be

followed by septic troubles in the nose, accessory sinuses, middle ear, or cranial cavity. Bleeding often recurs on their removal. In any case they should not be left unchanged for more than twenty-four or, at the most, forty-eight hours. Removal is facilitated by soaking them well with liquid paraffin or peroxide of hydrogen, and detaching them slowly and gently.

In the **naso-pharynx**, plugging, except as a temporary measure while the patient is under a general anæsthetic, should only be had recourse to when the measures first described have failed. It is very painful, and is apt to lead to acute septic otitis media.

Bleeding in the **pharynx** is met by rest, cold affusions to the neck, and the sucking of ice. The more intractable form is dealt with when considering operations on the tonsils.

Hæmorrhage from the **larynx** is generally checked by rest, silence, cold affusions, and sucking ice.

Protection of the lower air-passages from the descent of blood.—When operated upon under *local anæsthesia*, the patient is able to prevent blood from descending from the nose or throat into the larynx and trachea. In this he is assisted by throwing the head forwards when bleeding starts in the nose, postnasal space, or pharynx, and by being allowed to cough and clear the throat when the larynx is being treated. In such operations as tracheotomy under local anæsthesia, all bleeding from vessels should be arrested before the windpipe is opened, and if blood does enter the trachea the patient should be encouraged to sit up and cough it out.

When the patient is under a *general anæsthetic*, other measures must be taken to guard against the descent of blood into the windpipe and lungs. The most important is to see that the anæsthesia is never so deep as to abolish the swallowing or coughing reflexes. Fortunately these are the last to go; yet in many cases it is well to let the patient come partly round, so as to expel blood and mucus by coughing. If the frontal sinus is being operated on, the nose is carefully packed beforehand. When the ethmoidal labyrinth is being cleared, or the sphenoidal sinus opened, a sponge may be placed, as described, in the postnasal space until the operation is completed (p. 280). The same result can be obtained by using Kuhn's peroral intubation (Fig. 59), an adaptation of O'Dwyer's intubation tube. This is inserted in the larynx, and to its upper extremity a rubber tube is connected, through which the anæsthetic can be continued, while the administrator is clear of the field of operation, and the lower air-passages are guarded against any invasion of blood or pus.* During the operation on the

* Kuhn, *Arch. f. Laryngol.*, Bd. xxv., Heft 1.

Franklin Hazlehurst, *Laryngoscope*, xxiii., 1913, No. 11, p. 1091.

maxillary sinus through the canine fossa, a sponge placed between the last molar teeth and the cheek on the same side, and frequently renewed, will keep any blood from entering the pharynx. When large or vascular growths are being dealt with in the pharynx, the lower air-tract can be completely protected by plugging the entrance to the larynx with a sponge, after a laryngotomy tube has been placed in the neck (*see* p. 773). In operations for removal of part of the larynx, a Hahn's tube is sometimes introduced into the trachea, or a tracheotomy tube is used with a sponge pushed down above it. Further protection is secured by operating with the patient in the Trendelenburg position.

In many proceedings, security is attained by rolling the patient well over to one side, so that the blood runs out of the corner of the mouth, or collects in the cheek, from which it can be sponged.

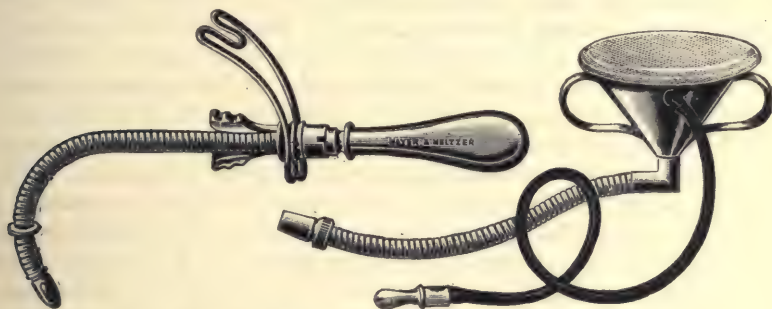


Fig. 59.—Kuhn's peroral intubation apparatus.

This allows of the larynx being plugged to prevent the descent of blood and mucus, and yet permits respiration and the administration of a general anæsthetic.

A good deal of blood is also swallowed. This may be vomited as consciousness returns; if not, an aperient should be given within twenty-four hours to prevent gastro-intestinal sepsis.

The descent of blood into the trachea and lungs, if sudden and copious, may produce immediate asphyxia; or, if less abundant, may cause septic pneumonia. When it occurs, the anæsthesia should be stopped, and the patient rolled well over on to his face or inverted, until the breathing in the trachea is cleared. At the conclusion of all nose and throat operations it is a wise precaution to keep the patient on his side, the head on a low pillow, and the face downwards, while the body is arranged in the gynecological position. He should occasionally change from one side to the other, so that gravity may assist the exit of blood and mucus from each bronchus.

Shock, particularly in operations on the nose, is apt to be marked in young children and in elderly persons. Hence we try to avoid the removal of adenoids in patients under three years of age, or of polypi in those over sixty, and in all cases we endeavour to operate as rapidly as possible. Removal of part or all of the larynx sometimes causes marked shock.*

This possibility of shock is guarded against and treated in the usual way. The use of cocaine and adrenalin, even in patients under a general anæsthetic, helps to avoid it,† and anæsthesia should never be too deep or prolonged. When operating under local anæsthesia it is sometimes wiser not to attempt too much at one sitting, e.g. to treat only one side of the nose at a time. In other conditions, and when a general anæsthetic is employed, it may be safer to try to complete treatment at one operation.

Sepsis and other complications.—Some of these possibilities have been mentioned when describing the use of the galvano-cautery, and others will be referred to subsequently. Deaths have been recorded after the simple use of the galvano-cautery or the removal of nasal polypi, and of course are more to be feared after major operations, such as the radical cure of sinus suppurations or extensive proceedings in the pharynx or larynx. These accidents may be due to direct septic infection, or to thrombosis.‡ The orbit may be invaded in operations on the ethmoid, the external muscles of the eye may be injured in the frontal sinus operation, and optic atrophy may be due to plugging of the ophthalmic vein. Septic infection from nasal operations may spread to the accessory sinuses, meninges, ear, eye, tonsils, glands, gastrointestinal tract, bronchi, and lungs. From the naso-pharynx the ears and the lower food- and air-tracts are chiefly threatened. In the larynx the principal risk is septic pneumonia.

While these accidents may sometimes be due directly to operation, it is well to remember that, in treating such septic conditions as are entailed by nasal suppuration or disease in the pharynx, the complications may only be precipitated by traumatism or may be purely coincident. It should not be forgotten that latent

* Chevalier Jackson, *Journ. of Laryngol.*, xxi., 1906, p. 632.

† G. W. Crile, *Journ. Amer. Med. Assoc.*, June 17, 1905.

‡ J. Merckx, *Ann. des Mal. de l'Oreille*, 1906, ii., p. 199. (Meningitis simply from removal of a polypus from the middle turbinal; but the patient had double ethmoid and frontal suppuration of many years' standing.)

Broeckaert, *Ann. des Mal. de l'Oreille*, Déc., 1894. (Death after removal of polypus with the galvano-cautery; but the autopsy showed multisinusitis.)

H. P. Mosher, *Journ. of Laryngol.*, 1907, p. 363. (Fatal meningitis after removal of anterior end of middle turbinal; but foul pus was present in many of the accessory cavities.)

G. L. Tobey, jun., *Journ. of Laryngol.*, July, 1907, p. 363. (An analogous case.) Grünwald, *Centralbl. f. Ohrenheilk.*, Aug., 1908.

infection—of influenza, erysipelas, measles, scarlatina, diphtheria, or the like—may develop immediately after an operation on the nose or throat, and until its true character is recognized the operation is often unjustly blamed. Septic infection, in exposed wounds of the air-passages, may be traced to insanitary surroundings.

After-results: insufficient or excessive removal of tissue.

—Incomplete operation may be unsatisfactory in many ways. Thus, nasal obstruction may be unrelieved; foci of suppuration may be left in the accessory sinuses; portions of adenoid growth or tonsils left behind may continue to give trouble; malignant growths may not be extirpated freely enough. On the other hand, operations may fail to relieve, or even produce a worse state of affairs, if too much tissue is sacrificed.* This is important as regards the nose, owing to the respiratory and defensive functions of its mucous membrane. It is a good rule to injure the inferior turbinal as little as possible, otherwise a condition of crusting rhinitis may be set up, with secondary atrophy in the pharynx and larynx.† Unskilful operations in the pharynx may lead to the loss of the uvula or faucial pillars, in the larynx to injury to a vocal cord, and in the trachea to permanent stenosis.

Much judgment is required in adapting the suitable operation to each case. While in some instances one or more small interventions are all that is required, in another a well-planned and more extensive operation may be indicated. In any case, the advice of Semon should be kept in mind, namely, that the magnitude of an operation should not exceed the gravity of the symptoms calling for relief.

Reflex sequelæ.—Functional aphonia, temporary amaurosis, temporary loss of memory, spasmodic cough, and neuralgia are among the various accidents which have followed cauterization or insignificant operation in the nose and throat. In some cases the symptoms may be referable to the toxic effect of the cocaine (cf. p. 71). Semon has recorded the case of a man, aged 39, in whom exophthalmos with symptoms of Graves's disease (Gräfe's sign, Stellwag's symptoms, rapid pulse), and later on complete premature baldness, followed on repeated operations with snare and galvano-cautery for removal of recurrent nasal polypi.‡ Charsley has observed marked enlargement of the glands of the neck, protrusion of the eyeballs, and pulse-rate of 110 lasting

* Friedrich, *Zeits. f. Laryngol.*, Bd. iv., Heft 3, and *Journ. of Laryngol.*, xxvii., 1912, No. 10, p. 571.

† W. H. Stewart, *Proc. Laryngol. Soc., London*, v., May, 1898, p. 57.

‡ *Ibid.*, i., 1893, p. 41.

for three months, after treatment of the turbinals with galvano-cautery.* Cresswell Baber mentions the case of a man in whom removal of polypi with the cold snare was followed by diplopia.† In this latter case the symptoms disappeared under the administration of perchloride of mercury and iodide of potassium, and numerous growths were subsequently removed without any return of the ocular disturbance. This observation indicates that many sequelæ which may be ascribed to nasal operations are due to entirely different causes, and that, at the most, the operation may only have a determining influence.

Assepsis. After-treatment.—As already remarked, the field of operation can never be rendered completely sterile.

In the nose, when there is no suppuration, it is safer to make no attempt to purify the cavity beyond cleansing the vibrissæ and vestibules (cf. p. 7). The Schneiderian membrane will not tolerate any antiseptic lotion of such a strength as to be effective, and weaker solutions only interfere with the action of the cilia, the protective power of the mucus, and other defensive arrangements of the nose. If pus, scabs, or foreign bodies exist in the nose, it should be well washed with a simple, tepid, alkaline solution (Formulæ 8 to 11). When operating on the pharynx and larynx it is well to see that the teeth and gums are rendered as clean as possible by free use of a tooth-brush and suitable mouth-wash, and, in some cases, by a visit to the dentist.

But every care should be taken to purify the surgeon's hands, sterilize all instruments, and see that no contamination takes place during the operation. This is assisted by having the patient's head surrounded by a sterilized towel, and his face, moustache, and beard well washed, for the surgeon's hands and instruments come in frequent contact with these parts. Contamination from the hands or instruments of the anæsthetist must be guarded against.

After all intranasal operations, everything should be avoided which interferes with the drainage, ventilation, and natural repair of the region. Protective dressings cannot be employed, and we have to aim in most cases at healing under a blood-clot. Tags of semi-detached tissue and loose clots of blood are removed, but otherwise the parts are disturbed as little as possible. For the first two or three days the nose may be left alone, and if there is no bleeding the patient is encouraged to breathe up and down it. When there is much formation of thick mucus, or blood-clots or sloughs are loosening, a warm alkaline lotion can be employed (Formulæ 8, 11, used as directed on p. 57). The pain of

* *Proc. Laryngol. Soc., London, i., 1893.*

† *Ibid.*

stiffness or dryness in the nose is relieved by an ointment or an oily spray (Formulæ 74, 68, 69).

Adhesions are apt to form between the septum and the outer wall when opposing surfaces are injured by the galvano-cautery (p. 67). They may occur in narrow cavities after cutting operations. If an adhesion is seen to be threatening in the first few days, it should be broken down with a probe, and strips of gauze or plates of white celluloid introduced daily until healing takes place. If it forms later, it is wiser to wait until the fleshy bridge becomes less vascular and contracts, when it may be divided with a knife or the galvano-cautery at a white heat, and the opposing surfaces are then kept apart as described (cf. p. 177).

Wounds in the naso-pharynx are best left alone, unless cleansing or the insufflation of antiseptic powders is indicated (Formulæ 8 and 23). The same principles apply to the after-treatment of operations in the pharynx. In the larynx, rest to the voice is of much importance and complete silence may be required. Cleansing or soothing sprays, inhalations, or powders may be called for, and sedative or antiseptic lozenges are helpful.

All postoperative conditions in the nose and throat will heal more rapidly and pleasantly if the patient is freely exposed, day and night, to abundance of fresh air; and, while fatigue is generally to be avoided, the sooner the patient is out of bed and in the fresh air, the better for him. The inability to operate under aseptic conditions should make us more careful to raise by general care the resistance of the individual, and to protect him from external dangers.

PART II.—DISEASES OF THE NOSE

CHAPTER V

SYMPTOMS OF NASAL DISEASE

DISEASES of the nose and naso-pharynx may manifest themselves by local and also by more remote symptoms. These symptoms, both local and remote, may be considered under six headings :—

1. Symptoms in the upper air-passages, produced by—
 - (a) Diminished nasal respiration.
 - (b) Reflex effects.
 - (c) Descending infections of the air-passages.
2. Digestive troubles, due to—
 - (a) Mouth-breathing.
 - (b) Swallowed septic matter.
3. General and developmental troubles—
 - (a) Insufficient respiration, and consequent inadequate hæmatosis.
 - (b) Exaggerated efforts of inspiration, and consequent deformities of chest and spine, in childhood.
 - (c) Chronic auto-toxæmia.
4. Cerebral affections, consequent on—
 - (a) Intimate connexions between the vascular and lymphatic circulations in the nose and brain.
 - (b) The immediate anatomical relationship of the nasal fossæ and accessory sinuses to the brain.
5. Affections of the ear and the eye.
6. External affections of the nose—congestion, thickening, eczema, acne rosacea, erysipelas.

NASAL OBSTRUCTION. MOUTH-BREATHING

One of the most frequent and most important consequences of nasal disease is obstruction to respiration. The harmfulness of the mouth-breathing entailed in marked cases is now generally accepted; but as obstruction is a factor in numerous nasal affections, and as many of its possible consequences are not

always recognized in good time, the subject deserves brief consideration.

The nose is the natural and instinctive channel for carrying on respiration.* The mouth is only used occasionally as a subsidiary route.† With rare exceptions all infants breathe entirely through the nose. If the nose of a sleeping child is gently closed he will continue to make increasingly violent efforts to draw through it; when these prove useless he will waken and gasp for breath, instead of simply opening and using the mouth as an air-way. Hence a baby with even partially obstructed nostrils is unable to suck the breast or the bottle, and after one or two draws is compelled to relax his hold in order to get a mouthful of air. When asleep, either because of this "overpowering instinct" (MacDonald and C. A. Parker), or because the tongue falls back and further obstructs the air-way (MacKeown), or because volition is not at work to supplement the nasal with the buccal channel, a small child often persists in vain efforts to draw a sufficient supply of air through the nose. This results in snoring and noisy respiration, and indrawing of the sternum and lower ribs. Even when mouth-breathing is partially adopted to supplement the nasal air-way, the latter remains the route preferred by instinct, and as much air as possible is drawn through it. Mouth-breathing is an acquired habit. When it comes on in adults with fully developed frames, some of the results of nasal obstruction are not manifested.

Nasal obstruction may be partial or complete, intermittent or constant. It may affect one side only, or it may vary from one side to the other. Sometimes it is unnoticed or denied by a patient, although, when observed, he is seen occasionally to draw a supplementary breath through the mouth, or the physical signs in the nose or throat may demonstrate his nasal insufficiency.

The protective benefits of nasal respiration have already been referred to (p. 6), so that the symptoms and consequences of nasal obstruction can now be tabulated, and in this way they need not be recapitulated later on when considering various diseases which, in addition to other symptoms, are productive of nasal stenosis.

EFFECTS AND SYMPTOMS OF NASAL OBSTRUCTION

Direct effects on the nose:—

Inactive *alæ nasi*.

Diminished ventilation of nose.

Arrested development leading to permanently narrow nasal passages.

Arrested development leading to deviations of the septum.

Arrested development leading to defective growth of the upper maxilla, with arching of the palate, V-shaped alveolar arch, and crowded teeth.

Tendency to frequent and prolonged nasal catarrhs, and hypertrophic rhinitis.

* C. W. Richardson, *Ann. of Otol. and Laryngol.*, June, 1913.

† "Look to thy mouth, diseases enter there" (George Herbert, "The Church," stanza 22).

Postnasal catarrh, and increase of adenoid tissue.

Catarrh of the Eustachian tubes, and acute or chronic otitis media.

Symptoms of nasal obstruction:—

Difficulty in clearing the nose of mucus.

Noisy nasal respiration, with sniffing, heavy breathing, and snoring.

Loss of nasal resonance and alteration of voice.

Anosmia.

Deformity of the chest-walls.

Deficient aeration of the blood, particularly at night, tending to—

Restless sleep; night-terrors; laryngeal spasm; laryngismus stridulus; cyanosis; night-sweats; with occasional attacks of so-called "false croup."

Morning headache; peevishness; anorexia with pharyngeal and gastric catarrh.*

Mouth-breathing, associated with—

Typical facies.

Dry mouth.

Spongy gums.

Dental caries and tartar.†

Slowness in eating, or necessity of bolting imperfectly masticated food.

Recurring tonsillitis and pharyngitis.

Laryngitis sicca and laryngeal catarrh.

Bronchitis and pulmonary affections.‡

Deficient expansion of chest.

Gastric catarrh.

Increased tendency to contract measles, diphtheria, or scarlatina.

General symptoms:—

Impaired sense of well-being; lassitude.

Muscular weakness; tendency to lateral curvature.

* L. H. Pegler, "Headache in association with Obstruction in the Nasal Passages," *Brit. Med. Journ.*, 1910, ii., Nov. 26, p. 1701.

† Guye, *Journ. of Laryngol.*, July, 1895.

T. Manciola, *Arch. Internat. de Laryngol.*, xviii., 1904, No. 4, p. 141.

‡ Moeller and Rappoport, *Zeitschr. f. Tub.u. Heilst.*, July, 1903; and Epitome in *Brit. Med. Journ.*, Jan. 9, 1904.

W. C. Rivers, "The Comparative Frequency of Impaired Nasal Respiration as an Antecedent to Pulmonary and Extra-Pulmonary Tuberculosis," *Brit. Med. Journ.*, June 16 and Dec. 1, 1906.

W. Freudenthal, "On the Etiology of Pulmonary Tuberculosis in relation to Diseases of the Nose and Throat," *N.Y. Med. Journ.*, Dec. 19, 1903.

Breathlessness on exertion ; patient feels no inclination to sing or whistle.

Malnutrition ; anæmia ; * arrested growth.

Aprosexia ; slowness of cerebration ; inaptitude for mental exertion ; depression ; shyness ; listlessness ; querulousness.†

Symptoms of reflex or mixed origin :—

Twitching of facial muscles.

Hay-fever ; asthma ; emphysema.

Persistent cough.

Stammering ; stuttering.

Nocturnal enuresis.

Epilepsy and epileptiform convulsions.

Chorea.

The symptoms and results of nasal obstruction will vary in each individual case, according to the predisposition, surroundings, and age of the patient. If the stenosis sets in after puberty, the changes in the physiognomy and physical development do not occur, and the alteration in the voice is less marked. Although obstruction in the nasal chambers will increase a tendency to hypertrophy of the adenoid tissue in the postnasal space, it is more common for obstruction in the latter region to induce all the symptoms of nasal stenosis.

The symptoms tabulated above are not all necessarily a direct consequence of merely mechanical obstruction to the nasal air-way. Nasal stenosis is so often associated with chronic infective processes that it is difficult in some cases—e.g. otitis media or enlarged cervical glands—to say how much is to be attributed to the nasal obstruction, and how much to secondary septic or other infections.

Some of these symptoms may now be referred to in detail.

The *alæ nasi* may dilate vigorously so long as the instinct of nasal respiration is not being replaced by mouth-breathing (Fig. 60). With the establishment of breathing by the mouth the muscles which distend the nostrils (i.e. the *levator labii superioris alæque nasi* and the *levator anguli oris*) atrophy from want of use, the *orbicularis oris* loses its tone owing to the constantly open mouth, and, consequently, the lines round the nose and mouth disappear, and the face becomes smooth and expressionless (Fig. 61), while the anterior nares may be reduced to mere slits (Fig. 62).

Diminished ventilation through the nose leads to insufficient drainage, stagnation of secretion, and lowered powers of local defence.

* For alteration in blood, see under Adenoids, p. 325.

† Guye, *Brit. Med. Journ.*, 1889, ii., p. 709.

Guye, *La Parole*, 1900, No. 9.

Walter A. Wells, *Amer. Journ. Med. Sci.*, Dec., 1898.

Infections of the accessory sinuses are more apt to occur in the narrower of the two nostrils. The arrest of development in the nasal chambers and upper jaws conduces to deviations of the septum, the development of a V-shaped alveolar arch instead of the normal horse-shoe form,



Fig. 60.—Adenoid subject without the adenoid facies.

Boy aged 4, with nasal obstruction (adenoids). He has not yet acquired the habit of mouth-breathing, and in his instinctive, but ineffectual, efforts to draw sufficient air through the nose, the chest has become flat, the sternum indrawn, and the shoulders rounded.

with consequent prognathism, and a Gothic instead of a Norman arch to the hard palate. As a result of this the temporary teeth are packed closely together, and the permanent set are delayed in eruption.

When the latter do appear they are crowded irregularly and tend to overlap, for the alveolar arch, which held the temporary teeth with difficulty, is not sufficiently developed to accommodate the permanent ones (Fig. 62). The causation of these changes is still a subject of discussion. Diminished atmospheric pressure, the lateral compression of the cheeks consequent on mouth-breathing, racial peculiarities, an hereditary tendency to leptoprosopia, the use of the rubber teat and "baby comforter," and dental defects, have all been invoked to explain it. It is certain that these facial deformities are rarely if ever congenital; they can frequently be watched while developing after nasal obstruction,



Fig. 61.—Mouth-breathing.

The pinched nostrils and inactive *alæ nasi*, in a case of marked nasal obstruction in a child. Note the open mouth, the want of expression, the slit-like nostrils, and compare with Figs. 62 and 174. The adenoid growth removed from this patient is shown in Fig. 187, p. 338. (*From a photograph.*)

and if this is removed they generally become arrested. Ziem's experiments are often quoted in support of this view; he closed up the nostrils of puppies, and found that deformities in the neighbouring bones resulted later on. Still, an hereditary tendency to a high-arched palate would more readily induce mouth-breathing in slighter degrees of nasal obstruction, and we must remember that the so-called "adenoid facies" may be met with in children without adenoids* (Fig. 63).

The tendency to nasal and postnasal catarrh is a consequence of the diminished ventilation and the weakened local defensive arrange-

* T. F. Pedley, *Brit. Med. Journ.*, Oct. 20, 1906.

The subject is fully discussed by Lack ("Diseases of the Nose," London, 1906); and, in addition to the bibliography he appends, the following may be consulted:

A. Courtade, *Arch. Internat. de Laryngol.*, xvi., 1903, p. 320.

Schütter, *Ann. des Mal. de l'Oreille*, xix., 1893, No. 4, p. 334.

Mendel, "Physiol. et Pathol. de la Respiration Nasale." Paris, 1897.

ments already referred to. As regards the catarrh of the Eustachian tubes and middle ear, it is uncertain if this is directly attributable to mere mechanical obstruction in the nasal chambers, for it is no necessary or even usual accompaniment of nasal polypi or of deviation of the septum. The removal of nasal stenosis will often improve chronic ear-trouble by facilitating ventilation of the Eustachian tube, but the origin of the otitis is generally traceable to affections of the postnasal space (*see* p. 321).



Fig. 62.—Mouth-breathing.

A young woman, showing the mouth-breathing and permanent disfigurement left by nasal obstruction (adenoids) in childhood. Note the expressionless face, the hanging lower jaw, the open mouth, and the crowded teeth—projecting and overlapping one another.

Snoring is not necessarily proportionate to the amount of obstruction. Adults may sleep with wide-open mouth and not snore, or may snore with the mouth closed.

Speech is but slightly altered if the nasal stenosis originates in adult life, unless the obstruction is nearly or quite complete. The change is most marked in children, who are often said to “speak through the nose.” This is, of course, exactly what they fail to do; the diminished nasal resonance gives a dead tone to the voice, properly called *rhinolalia clausa*, as distinguished from *rhinolalia aperta*, which occurs in such conditions as cleft palate, where there is too free an escape of phonatory air through the nose. This lack of nasal resonance

s noticed in pronouncing the consonants *m* and *n*, which tend to be replaced by *b* and *d*, while *c* is replaced by *g*. So that "Clapham Common" somewhat resembles "Glaphab Gobbod," and "a cold in the nose" becomes "a gold id the dose."

Deformity of the chest-walls in childhood is generally attributed to mouth-breathing (Fig. 174, p. 322); but it is really due to the persistence of the natural instinct of nasal respiration, and occurs in cases of nasal obstruction where mouth-breathing has never been employed (Fig. 60). Even when the child acquires the habit of using the mouth as a subsidiary air-way, instinct still impels him to make ineffectual efforts to gain sufficient air through the obstructed nose. This leads to indrawing of the lower end of the sternum, or retraction of the lower ribs (Harrison's sulcus), or the ribs are drawn in laterally while the sternum and costal cartilages become prominent (pigeon-breast).

The inefficient expansion of the thoracic cage appears to be partially compensated by increased downward action of the diaphragm, and this may account for the slouching figure and protuberant epigastrium (Fig. 174). As the pectoral muscles are never firmly braced for the elevation of the upper ribs, the shoulder-blades tend to fall forward, producing the "round shoulders" and projecting scapulæ.

Even when mouth-breathing is adopted it is not as satisfactory as is the nasal route. Lermoyez and Boulay have shown that inspiration and expiration are both greatly hindered by mouth-breathing, sometimes to an equal degree, but more often the expiration is more difficult.* Mendel showed that the ratio of the air passing through the nose to that passing through the mouth is as 1.25 to 1.00.†

C. Poli, after observations on a patient wearing a tracheotomy tube, came to the conclusion that mouth-breathing is not so deep, frequent, or rhythmical as natural nasal respiration.‡

Restless sleep, with its accompanying disturbances of night-terrors or laryngeal spasm, is explained by this same instinctive adherence of the child to the use of a nasal air-way, even when obstructed.

The facies of the habitual mouth-breather is often referred to as the "typical adenoid facies." It is generally, but not always, due to adenoids; and adenoids may occur without it. It should be called the facies of the mouth-breather; but it will be described again when adenoids are under consideration.



Fig. 63.—The so-called "adenoid facies" in a patient without adenoids.

The appearances are due to congenital stenosis of the nasal fossæ and naso-pharynx in an imbecile subject to epilepsy. (Escat.)

* *Presse Médicale*, 1897, No. 49.

† *Médecine Moderne*, xxx., 30 Mars, 1898, p. 201.

‡ *Arch. Ital. di Otologia*, xiv., 1903, fasc. 2, p. 129.

FUNCTIONAL ABEYANCE OF NASAL RESPIRATION

Patients are occasionally met with who breathe only through the mouth, although there is a free air-way through the nose and naso-pharynx. Not only do they keep the mouth constantly open, but if the lips are kept closed they seem to have lost the faculty of making use of the nasal thoroughfare, and become blue from asphyxia.* In some of the cases the patient talks with the "dead voice" of the adenoid subject.

This condition is generally met with in hysterical persons; it is somewhat analogous to functional aphonia, and should be treated on the same principles.

A more common condition is that in which, after the removal of long-standing obstruction, the patient is found to have partly lost the instinct of nasal respiration, and continues to be a mouth-breather. In such cases it is often suggested that the obstruction has been incompletely removed or has recurred, when the simple fact is that the patient has to be re-educated in the use of the now unobstructed nasal thoroughfare. This is often attempted by tying up the chin, as in a bandage for broken jaw, but it is more pleasantly effected by training the child with respiratory exercises, and encouraging the playing of various games, such as skipping, rolling a hoop, and dancing, while keeping the mouth firmly closed.†

In treating nasal stenosis it is well to remember that much may be done to improve it by attention to the teeth and efforts to secure a broad, Norman palate and well-expanded alveolar processes. This entails the wearing of an expanding tooth-plate and the care of a skilled dentist.‡

* M. Lermoyez, S.c. Méd. des Hôp. de Paris, séance du 20 Jan., 1899.

M. Lermoyez, *Presse Méd.*, 2 juillet, 1904, p. 420.

L. H. Pegler, *Journ. of Laryngol.*, July, 1902.

† Alice R. James, "Ball Games and Breathing Exercises." London, 1908.

Percy Lewis, M.D., "A Manual of Medical Exercises," 2nd ed. London, 1910.

‡ W. H. Haskin, F. B. Noyes, A. H. Ketcham, and Sinclair Tousey, *Laryngoscope*, xxii, 1912, No. 11, pp. 1237-1310.

CHAPTER VI

ON "TAKING COLD"; INFECTIOUS CATARRH

THE upper air-passages afford the most favourite site for the manifestations of the condition known as catarrh, and the influence of cold has been generally invoked as the primary causative agent of this condition. The effects of sudden changes of temperature, exposure to draughts or wet, damp feet, and insufficient clothing, have been held responsible for "taking a chill," which was then supposed to show itself by a catarrhal condition of the mucous membranes. As a corollary, treatment has been directed to avoidance of these conditions; going out in the rain has been looked upon as risky; any flow of fresh air has been carefully guarded against; efforts have been directed to maintaining a uniform temperature indoors; the body has been loaded with heavy clothing, and "flannel next the skin" has been recommended as a fetish.

This view of catarrh has been supported by many arguments which, though ingenious, were full of contradictions. Increasing knowledge of the affections of the upper air-tract has shown the true factor of many infections which were formerly attributed to "cold," and a better acquaintance with the defensive and self-regulating mechanisms in the human body has given a more physiological explanation of the causes and prevention of catarrh.*

To save repetition in subsequent chapters a general consideration will now be given to this subject.

Symptoms.—The symptoms of a so-called ordinary cold are too well known to require detailed description. They will vary as the attack is most manifested in the head (i.e. the nose and its accessory cavities), the throat, or the chest, and also with the local and general predisposition, and the nature of the infection. The incubation period may vary from one to two or three days. Most commonly a catarrh originates in the nose, spreading in many instances to the accessory sinuses of the nose, the Eustachian tubes and middle ear, the pharynx, larynx, and occasionally to the trachea and bronchi. But it is not uncommon for a cold

* R. Prosser White, "Catarrhal Fevers." London, 1906.

to manifest itself first in the postnasal space, whence it spreads forwards to the nose and downwards to the pharynx and larynx. It may begin in the pharynx and extend along the same routes. More rarely it originates in the larynx, when it is not so apt to invade the upper cavities, although it is still likely to spread to the lower air-tubes. The point of origin, the direction of spread, and the intensity of symptoms doubtless depend on local predisposition, which also explains the subsequent persistence of chronic trouble in any of the regions invaded.

Apart from local manifestations—to be considered in later chapters—the onset of a cold is often indicated by a feeling of chilliness. This is frequently referred to the neck, shoulders, back, or legs, and is looked upon as the direct result of exposure of these parts to cold air, whereas it is only one of the developing symptoms, like headache, sore throat, or cough, of the already contracted disease. The chill may be so slight as to escape notice, or may amount to a shiver or rigor. Malaise, depression, listlessness, and prostration are frequent, although in some cases patients feel brighter with the efflorescence of symptoms. Appetite may be absent or capricious. Digestion is generally interfered with. The patient feels feverish, although the temperature may be but slightly raised.

The course of the disease will vary with its intensity, the general resistance of the individual, local predisposition, the surroundings of the patient, and the treatment employed. A popular saying has it that a cold is three days coming, three days staying, and three days going; while a French authority satirically remarks that “un rhume non traité dure deux semaines, traité il ne durerait que quinze jours.”

Varieties.—Confusion as to the causation of a “cold” has partly originated from the fact that numerous diseases of the air-passages, manifesting themselves chiefly by catarrh, have formerly been grouped together. Thus the vaso-motor turgescence of the mucous membrane of the nose may originate in certain individuals from some reflex, such as a chilling of the feet, sudden exposure to bright light or damp air, inhalation of vitiated air, gastric disorder, or sexual irritation; but this cannot be regarded as coming in the same category with the symptoms at present under consideration. Hay-fever and paroxysmal sneezing must be differentiated. Infections of the pharyngeal or palatine tonsils, misuse of the voice, the irritation of tobacco or alcohol, are examples of what may result in “catarrh,” but must be distinguished from what is called “taking cold,” just as the rhinitis of measles, or the laryngeal catarrh of a phthisical subject, has a different causa-

tion. The study of diseases in the accessory sinuses of the nose has also revealed a hitherto unsuspected source of "catarrh," and in many instances we are now able to isolate the infective organism which stimulates them to secrete (*see* Chap. xiv.). These considerations help to define the causes of "catching cold."

Etiology.—No age, climate or season is exempt. Although infants and the aged suffer most from exposure to a lowering of the outside temperature, they are less apt than others to "catch cold." The aged may be afflicted with bronchitis or emphysema—possibly the results of previous cold-catching—but they are much less subject to catarrh in the upper air-passages. Acute rhinitis, in fact, is a rare affection of the elderly. On the other hand, children are particularly susceptible to catarrh of the nose and throat. This, apparently, is associated with their recognized proneness to infection of the lymphoid tissue so freely distributed through this region in youth.

"Colds" are as frequent in warm as in cold climates, if patients are otherwise exposed to similar surroundings. They occur as severely, if not as frequently, in summer as in winter. It is difficult to explain why they are so much more common in the spring and autumn months, but we are not yet able to explain why many other infections occur with greater frequency in certain seasons, nor why peritonsillar abscess (in which the local predisposition plays such an important part) is also most common at these seasons.

That an atmosphere of clouds, fog and rain is not directly the cause of catching cold is shown by the experience of workers in the Ben Nevis observatory.* That low temperature does not produce it is shown by the Arctic and Antarctic expeditions of Nansen, Wilson, Scott, and Shackleton. That sudden changes of weather and temperature have no direct effect, in the absence of an infecting source, even under trying conditions, is evidenced by the immunity of sailors in long sea-voyages, and of soldiers on the veld. The most striking evidence is afforded by dwellers in open-air sanatoria. Cold-catching is rare among patients of any age, most of them with very low resistance, and many extremely feeble, although exposed to all varieties of weather and temperature. Damp houses predispose to catarrh much more than mere humidity of climate.

The infective nature of a catarrhal fever is strongly suggested by its abrupt onset and more or less regular course; by the common observation that a cold frequently runs through a house or

* Willoughby Gardner, *Birmingham Med. Rev.*, May, 1897, and March, 1898.

a stable; by the fact that dwellers on remote islands are seized with it when a ship visits them; and by noticing that travellers from polar expeditions are very apt to be attacked on landing in inhabited though warmer latitudes.

Predisposing causes.—Certain families show a tendency to contract catarrhal fevers, but this is more likely to be due to a family likeness as regards the air-passages than to a marked general susceptibility. Any local defect in the normal respiratory functions of the nose and throat weakens the defensive arrangements and favours invasion (cf. p. 5). The local as well as the general resistance is enfeebled by vitiated or contaminated air. Insanitary dwellings, hot, crowded, and dust-laden rooms or vehicles not only lower this resistance, but expose the individual to direct and close contamination. Everything which depresses the general condition—repletion, fatigue, hunger, mental depression, anxiety—favours invasion. It is in this same way that “cold” acts as a predisposing cause, just as heat and damp lessen resistance. Thus, on immersing a hen in cold water, it loses its resistance to anthrax. Frogs, on the other hand, early succumb to anthrax if kept warm at a temperature of 25° to 35° C.

Disorders of the digestive tract, certain constitutional diseases (diabetes, syphilis, tubercle), faulty metabolism, excesses of all kinds, in fact, anything which lowers the general resistance of the body, will predispose to local catarrhal infection. Gout and rheumatism are often blamed as predisposing causes. Dust, alcohol, and tobacco are potent factors, and sexual excesses conduce to it.

Bacteriology.—A specific organism of catarrhal infection has not been definitely isolated. Remembering the practically aseptic condition of the normal nasal mucous membrane (p. 7), it is possible that one specific organism will not be discovered, and it may be found that the natural defences of the nose are, under certain inimical conditions, overborne by the incursion of a diversity of organisms. In fact, colds appear to be due to the massive direct transmission of bacteria in warmed, confined atmospheres, followed by exposure to cold, moist, outer air. The danger is diminished by keeping the indoor air in movement.*

The *Bacillus coryzæ segmentosus* (= *B. septus*),† the *Micrococcus catarrhalis*,‡ the *Diplococcus coryzæ*§ (Hajek), the bacillus

* Leonard Hill and F. F. Muecke, *Lancet*, May 10, 1913.

† E. Cautley, 24th Ann. Rep. of the Local Govt. Board, 1894-95, p. 455.

‡ C. H. Benham, *Brit. Med. Journ.*, May 5, 1906.

R. Pfeiffer, quoted in article by Neisser in Kolle and Wassermann's "Pathologen Micro-organismen," ii., 1903, p. 146.

§ Hajek, *Berlin. klin. Woch.*, 1885, No. 33.

of Friedländer,* pseudo-diphtheritic bacilli,† and other organisms have been found associated with nasal catarrh. According to R. W. Allen, at least five organisms are capable of producing the symptoms of a common cold, viz. (i) *Bacillus influenzae*, (ii) *Bacillus septus*, (iii) *B. Friedländeri*, (iv) the *Micrococcus catarrhalis*, and (v) the *Micrococcus paratetrageus*. Chronic nasal catarrhs, according to the same investigator, all seem to be due to the bacillus of Friedländer.‡

Similarity of symptoms may be produced by variety of organisms. Until recently many diseases of the peritoneum, pericardium, lungs and pleuræ were attributed directly to cold, but we now know that they are really dependent on the action of toxic agents. Catarrhal fever should be regarded in the same way.

Pathology.—Catarrh is the name given to the inflammatory reaction on a mucous surface, by which the body defends itself from an invading organism or irritant substance. This reaction is characterized by increased hyperæmia and increased leucocytosis. Abundant mucin, cast-off mucous cells, and some leucocytes are poured out on the surface, forming a "catarrhal inflammation." If more leucocytes are stimulated to extrude themselves on the surface of the mucosa, the condition becomes one of "muco-purulent inflammation." If the reaction is more severe, with complete destruction of the mucous membrane proper, the leucocytic exudation tends to favour a deposit of fibrin on the surface, and we get a "membranous inflammation." More severe destruction produces "ulceration." If there is a tendency for the process to invade the submucosa, the latter becomes infiltrated with pus, and this form is called "phlegmonous inflammation."

In chronic inflammation there is the same increase of hyperæmia, cell nutrition, and migration of leucocytes, but to a slighter degree, while it also leads to a proliferation of connective-tissue cells.

Immunity.—The infectious nature of catarrhal fever has been shown by the evidence afforded by isolated bodies of individuals—on islands, ships, or in sanatoria. It is more difficult to adduce proof from the cases occurring in larger or less isolated communities, firstly, because the virus is so constantly at hand and so widely disseminated, and secondly, because a certain immunity is doubtless developed in those who are thus exposed. Long-continued freedom from an attack of "cold," and robust health, do not protect an individual who has not been exposed for some time to infection. On the contrary, voyagers returning from a polar cruise, and visitors leaving a sanatorium, are apt to contract a catarrh which is more acute than any subsequent ones when they resume town life.

* R. W. Allen, *Brit. Med. Journ.*, May 12, 1906, p. 1131.

† Neumann, *Zeit. f. Hyg.*, Bd. xl., 1902, Heft 1, p. 33; and *Brit. Med. Journ. Epitome*, Oct. 25, 1902.

‡ *Lancet*, Nov. 28, 1908, p. 1589, and Dec. 5, p. 1659.

Prevention.—The patient who is frequently contracting prolonged “colds” generally requires attention to his upper respiratory tract, or to his habits of life. The nasal, postnasal and accessory cavities should be carefully attended to. The diminished resistance of mouth-breathers has already been referred to (p. 94). The great value of fresh, frequently renewed air must be insisted on, particularly as regards the bedroom, for, if we accept eight hours’ sleep as a fair average, then one-third of human existence is passed in that important chamber. Not only is unvitiated air desirable as being the natural atmosphere of the air-passages, and for its own vitalizing effect in respiration, but because of its stimulating action on the skin. The healthy action of the latter should be maintained by baths and exercise, and by wearing simply a sufficiency of clothing. Warm baths—even hot, as in Japan—by their cleansing and stimulating action on the skin probably harden a patient more against catarrh (particularly if followed by a brisk rub down, a cold douche, or some physical exercises) than jumping in and out, uncleansed, from a cold tub. Open-air games and sports are better than any formal indoor exercises. An hour’s walk is better, particularly for elderly subjects, than half an hour of dull, mechanical “movements” in a stuffy and dusty gymnasium. When open-air exercise is not available, it must be replaced or reinforced by fencing, boxing, or some physical-culture exercises. Clothing must be regulated according to the atmospheric conditions, the age, health, vigour, and occupation of the patient. Too much clothing predisposes to catarrh, just as much as too little. The skin can, by training, be rendered less sensitive, and the depressing effect of external cold by reflex action can thus be avoided. When sitting still, or exposed to chilling winds, covering is often not sufficiently increased, while people are very apt to take active exercise unduly loaded. Sitting in wet clothing is not so depressing as sitting with soaked boots.

Children are often sent out with their necks stifled in mufflers, the head stuffy in a woollen cap, and the legs weighted with heavy gaiters. These are exactly the parts of the body which least require protection; and children may be seen flushed and fatigued at their games, when it is only the heat and weight of unnecessary clothes which tire them. The hands and knees are frequently left exposed to depressing cold, and the unnecessary jacket in which they are wrapped up would be much more useful if put on when their games or exercises are over and they are “cooling down.”

Flannel, or wool in some form, is not a suitable material for wearing next the skin. Flannel is recommended because, by reason

of the air-spaces it contains, it is a bad conductor of heat. But the objection to it is that it is not absorbent, and when worn next the skin it imprisons the moisture, and thus gives rise to deficient evaporation, diminished metabolism, and great disinclination to mental and bodily exertion.* Silk, linen, and cotton are preferable as underwear; these are all highly absorbent; are now manufactured in such a way as to contain air-spaces ("linen-mesh"), and this makes them efficient non-conductors of heat. Air being a bad conductor of heat, this cellular clothing is warm, while it rapidly carries off perspiration from the skin, and the natural action of the latter is thus maintained.

Errors in diet and excess of alcohol and tobacco are among the factors of diminished resistance which predispose the upper air-passages to catarrhal infection.

Rooms should not be overheated. Gas fires and stoves which devitalize the air are to be avoided. Low-pressure hot-water pipes are to be preferred in large buildings to the hot-air furnaces by which rooms in America are sometimes kept at 80° F. (Freudenthal). By these methods of warming not only is the atmosphere overheated, but it is rendered so dry that it soon exhausts the water-supply of the pituitary membrane, with the consequence that the erectile tissue responds to this, as to other irritations, by intumescence, and so is laid the foundation of nasal obstruction and all its possible consequences.

Direct infection should be guarded against. If the first sufferer from an infectious cold were promptly isolated (which is best done by confining him to bed), the disease would seldom spread through a household. This is what is done in many sanatoria when a visitor arrives with a cold; consequently it seldom or never spreads. Failing this, immediate proximity to patients with acute catarrh should be avoided, particularly in the early stages, and sufferers should avoid infecting others by coughing, sneezing, or kissing. There is also a risk of contagion from domestic pets.

General treatment.—The pathogenic organism can neither be expelled nor destroyed, once it manifests itself by local reaction. The latter, being the natural effect of defence and repair, should be guided but not checked. An acute infectious catarrh will run a much more rapid and mild course if a patient will promptly go to bed and remain there from one to three days. A mustard foot-bath, a warm bath, or a hot wet pack is first given; the patient is well wrapped up and kept warm with hot-water bottles and a woollen shawl round the head and neck, while the windows

* Leonard Williams, "Minor Maladies." London, 1906.

are left freely open day and night. A mild purgative and a mercurial may be given, followed by a morning saline of mineral water. Diaphoresis and diuresis should be promoted by warm drinks—hot water, tea, milk and soda-water, linseed tea, barley water, or lemonade, though hot whisky-and-water is more popular. The diet is simple, but if the emunctories are well cleared there is no need to limit it to “slops,” provided that meat and meat extracts are not too freely used. Opium in some form is a favourite remedy; but I think that all opiates retard recovery. The aching and feverish feelings are relieved by a few doses of aspirin, salicylate of soda, or salophen. Neuralgic pains may call for phenacetin or other nerve-sedatives. In the early stages the secretion of mucus may be promoted by ipecacuanha, antimony, or small doses of iodide of potassium (Formula 52). The outpouring of mucus is the best protection in early stages to an inflamed membrane, and attempts to check it by giving belladonna or other antiscarrhal remedies are unphysiological, frequently useless, and often distressing to the patient. Later on, with much secretion in the larynx and trachea, expectorants may be indicated (Formula 55).

When the acute stage is past, quinine, iron, arsenic, and similar tonics are useful; and change of air is often beneficial. The after-effects will be treated symptomatically. The local measures of relief for rhinitis, sore throat, or laryngitis will be referred to under their separate headings.

Those who think it possible to abort a catarrh are in the habit of ordering 10 to 20 gr. of pulv. ipecac. comp. at bedtime; or liquor opii sedativus in a dose of 20 drops at bedtime, or 5 drops every hour for three doses. Burney Yeo recommends the following draught at bedtime:—

R	Tinct. opii	.	.	.	.	.	℥x
	Vini ipecac.	.	.	.	.	.	℥v
	Spirit. eth. nit.	.	.	.	.	.	ʒi
	Liq. ammon. acet.	.	.	.	.	.	ʒiii
	Aq. camph. ad	.	.	.	.	.	ʒi

Some practitioners pin their faith to repeated small doses of tincture of aconite or spirits of camphor, while others prescribe $\frac{1}{10}$ gr. of pilocarpine every three hours.

Belladonna is much used with the same object in the form of the following tablet:—

R	Ext. belladonnæ	.	.	.	.	gr. $\frac{1}{4}$
	Camphor	.	.	.	.	gr. $\frac{1}{4}$
	Quinina sulph.	.	.	.	.	gr. $\frac{1}{4}$ —i

One every hour.

Atropine is sometimes applied to the nasal mucous membrane as soon as the earliest symptoms are perceived.

R Atropiæ sulph.	. . . . .	0·10
Aq. laurocerasi	. . . . .	20·0
Aquæ	. . . . .	20·0

This is employed as a spray or paint every half-hour or hour, but not oftener than eight to ten times a day. It is only advised for early cases, and before obstruction occurs.*

By injection of the corresponding bacterial vaccine an attack of acute cold due to any given organism or organisms may be shortened, and complications may probably be prevented. In a similar manner chronic infections may be cured. Considerable, if not complete, immunity against future attacks has been claimed (R. W. Allen). So far the failures of vaccine-therapy in infectious catarrh are probably much more numerous than its successes.†

Cinnamon is recommended by C. A. Parker to abort a nasal catarrh, if given in the first twenty-four hours, in the following way: two tablets of 5 gr. each every half-hour for two hours, then every three hours for twelve hours, and finally one tablet every four hours until all traces of a cold have disappeared. R. W. Allen gives oleum cinnamomi, 20 minims, in milk every hour for three doses, then 15 minims every other hour for two doses, and then ten minims every three or four hours. This may effect a cure in thirty-six to forty-eight hours.

Gustav Spiess claims that an acute catarrh in the early stage can be aborted by freely insufflating the postnasal space with orthoform.‡ Coryfin applied on a swab, or sprayed into the nostrils, may give relief.

* Boulai, *La Clinique*, 6 Sept., 1907. (Ref. in *Brit. Med. Journ. Epitome*, Dec. 21, 1907.)

† W. Douglas Harmer, *Proc. XVIIth Internat. Congress Med.*, London, 1913, Section xv., Part ii., p. 285.
A. Logan Turner, *ibid.*, p. 313.

‡ *Münch. med. Woch.*, 1901, No. 12.
Arch. f. Laryngol., 1901, p. 56.

CHAPTER VII

EPISTAXIS. INJURIES.

DISEASES OF THE VESTIBULE.

CONGENITAL OCCLUSION OF THE NOSTRILS

EPISTAXIS

Synonym.—*Nose-bleeding.*

Bleeding from the nose should be regarded as a symptom. In a few rare instances it may occur as a physiological process; more commonly it is caused by general conditions; but in the majority of cases it is due to a local vascular condition. In some instances local and general causes are combined.

Local causes:—

Traumatism: blows, falls, surgical treatment.

Traumatic abrasion, ulceration, or perforation (p. 154).

Multiple telangiectases.*

Rhinitis sicca (p. 138), and atrophic rhinitis (p. 140) from separation of crusts.

Adenoid growths.

New growths in the nose, innocent, like bleeding polypus and naso-pharyngeal fibromata; or malignant.

Syphilis.

Rarer local causes are—

Leprosy.

* W. Osler, *Bull. of the Johns Hopkins Hosp.*, Nov., 1901, p. 333.

Rendu, *Gaz. des Hôp.*, 1896, No. 135, p. 1322.

W. Legg, *Lancet*, ii., 1876, p. 856.

O. Chiari, "Erfahrungen aus dem Gebiete der Hals- und Nasenkrankheiten," S. 60. Wien, 1887.

C. O. Hawthorne, *Lancet*, 1906, i., p. 90.

A. Brown Kelly, *Glasgow Med. Journ.*, June, 1906.

F. Parkes Weber, *Proc. Roy. Soc. of Med.*, Laryngol. Section, Feb. 7, 1908, p. 43.

F. Semon, *ibid.*, p. 44.

A. Brown Kelly, *ibid.*, p. 44.

E. B. Waggett, *ibid.*, March 6, 1908, p. 70.

Lambert Lack, *ibid.*, March, 1909, p. 107.

K. Hoßler, *Wien. klin. Woch.*, xxi., 16 April, 1908, No. 16, S. 570.

Voigt, *Zeits. f. Laryngol.*, Bd. i., 1908, Heft 1, S. 19.

Frederick Hanes, *Bull. of the Johns Hopkins Hosp.*, March, 1909.

C. D. Van Wagenen, *N.Y. Med. Record*, Jan. 20, 1912.

Foreign bodies, leeches, worms, and maggots.

Lupus.

Hay-fever and paroxysmal sneezing.

Glanders.

Acute and chronic rhinitis.

General causes :—

High tension in the systemic arteries, as in arterio-sclerosis, hepatic cirrhosis, chronic interstitial nephritis, climacteric changes, violent or prolonged exertion or excitement, extremes of heat and cold.

High venous pressure, as in mitral stenosis, emphysema, bronchitis, whooping-cough, pneumonia, mediastinal growths, thoracic aneurysm, tumours in the neck.

Toxic blood states: Pernicious anæmia, chlorosis, purpura, scurvy, leukæmia, hæmophilia, and malaria. All acute infective diseases, especially enteric and variola. In the prodromal stage of measles, varicella, typhus, erysipelas, scarlatina, and influenza. Not infrequent in diphtheria, when it is a grave symptom; it may occur in the early stage when no diphtheritic process is visible in the nose. Ague; rheumatic fever, particularly in children.*

Rarefied air, as in ballooning and mountain-climbing.

Vicarious menstruation.

Drugs: Phosphorus, the salicylates, chloralamide, large doses of quinine.

Finally, the nose may only be a channel for the escape of blood, as in fractures of the base of the skull.

Epistaxis is rare in infancy. It increases in frequency from the third year until it reaches its maximum at puberty. Afterwards it is more rarely met with until the advent of advanced life, when its occurrence is a more serious symptom. It is commoner in males than in females.

Pathology.—It has been shown by statistics that in at least 90 per cent. of all cases the bleeding-point is situated on the anterior portion of the cartilaginous septum, at a spot known as Kiesselbach's area,† although it was first described by an American surgeon of the name of James L. Little.‡ This is about a quarter of an inch within the vestibule, and a quarter of an inch above

* Sydney Phillips, *Lancet*, Feb. 22, 1902.

H. G. Langwill, *Scot. Med. and Surg. Journ.*, Nov., 1908.

† W. Kiesselbach, *Aertzt. Intelligenzbl.*, No. 49, 1880.

W. Kiesselbach, *Berlin. klin. Woch.*, No. 24, 1884.

W. Kiesselbach, *Allgem. med. Zeit.*, No. 44, 1885.

Baumgarten, *Revue Internat. de Rhinol.*, etc., 1894, No. 15.

‡ Dan McKenzie, *Journ. of Laryngol.*, xxix., Jan., 1914, p. 21.

the floor of the nose (Fig. 64). Here the mucous membrane over the quadrilateral cartilage is very thin, and in it is seen running a little vessel which is a branch of the internal sphenopalatine as it anastomoses with a branch of the superior coronary (artery of the septum). The junction is often indicated by a racemose or varicose leash of vessels. This vessel might be called the "artery of epistaxis"; it merits the name in the same way that the vessel to the lenticular ganglion has earned the title of "the artery of

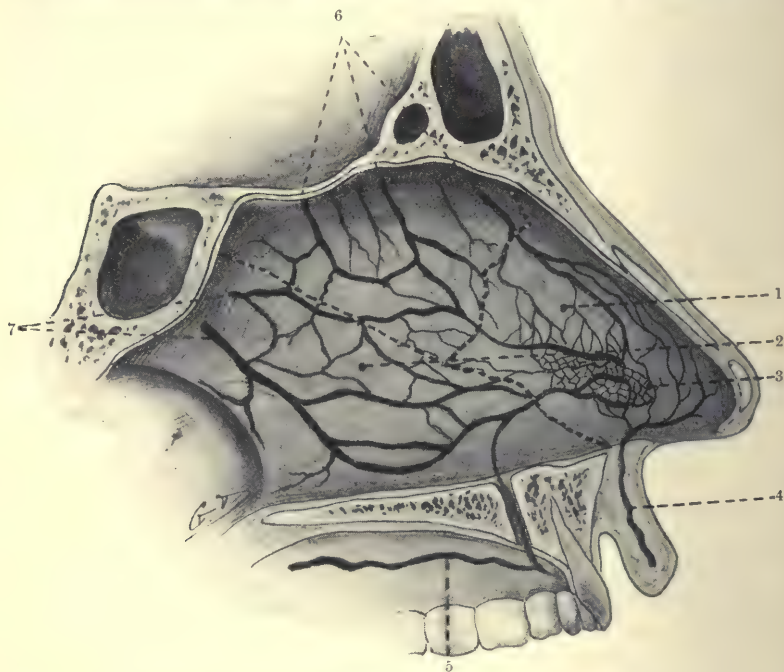


Fig. 64.—The bleeding area of the septum.

Sagittal section of the nose, showing the arteries on the right side of the septum. 1, The quadrilateral cartilage; 2, the vomer; 3, the "locus Kiesselbachii" or vascular area; 4, the artery of the septum; 5, the descending or superior palatine; 6, ethmoidal branches of the ophthalmic artery; 7, the sphenopalatine artery (from the internal maxillary), or "artery of epistaxis."

(After Cozzolino.*)

cerebral hæmorrhage." In many cases it will be seen to be turgid and varicose as it courses across the floor of the nose, just inside the vestibule (see Fig. 64).

Examination.—This epistaxis territory can frequently be inspected, without artificial light or special instruments, by simply tilting up the tip of the nose (as in Fig. 70, p. 120). In other cases

* *La Pratica Oto-rino-laringoiatrica*, Anno VI., Agosto, 1906, No. 4, p. 1.

the nose must first be cleared of clots, the bleeding checked with cocaine and adrenalin, and a speculum and a good light employed in order to determine the exact local conditions. Over the site of predilection the epistaxis vessel will then be seen, with blood oozing or flowing from it. Or the centre of the epistaxis area may be occupied by an ulcer, or by blood-scab. If no arteriole is visible, it is still this region which, in the majority of cases, is the source of hæmorrhage. This is proved by touching the velvety surface with a probe, when bleeding will generally be started.

Of course, when the epistaxis is caused by local growths, or by the detachment of scabs, it will come from other points, and when due to general causes it may come from various areas. A rare, but inveterate, form has been described by Brown Kelly, in which the blood comes from the anterior ethmoidal veins, high up between the middle turbinal and the septum.*

Diagnosis.—The detection of the local lesion prevents any mistake. It should be remembered that the blood may all pass backwards. In that case errors might arise owing to its being swallowed and appearing in the vomit or motions, or being coughed up and thought to come from the chest. It should not be overlooked that epistaxis in children often occurs when they are sickening for some infectious fever, generally enteric, whooping-cough, measles, or pneumonia.

Prognosis.—If epistaxis is dependent on local conditions, the prognosis is good, unless due to malignant disease. If due to a constitutional cause, it will depend on the nature of the condition. In diphtheria and some malignant infections it may be extremely difficult to check the epistaxis; otherwise the prognosis as regards the epistaxis is good, although the prospect in regard to the general health may be grave.

Treatment.—Epistaxis within limits, when occurring in robust children, particularly in boys about the age of puberty, is comparatively harmless and does not always require treatment. In conditions of high arterial tension, bleeding from the nose is looked upon as salutary, and not to be checked too hastily. But while the significance of epistaxis in cases of renal or hepatic cirrhosis should always be borne in mind, the salutary action is very transient, and nose-bleeding is so unpleasant and alarming that there is no reason why it should not be arrested if, at the same time, we adopt other measures for lowering vascular tension. Treatment may be considered as it is (1) local or (2) general; and local treatment will vary as it is required (a) to check the

* *Journ. of Laryngol.*, xv., 1900, p. 165.

bleeding and (b) to prevent its recurrence. Sometimes these two can be combined in one treatment.

Immediate arrest.—We can at once dismiss as antiquated the use of ergotin and vinegar, and similar internal remedies. The local use of iron, alum, gallic acid, and other astringents has also been superseded. They irritate the mucosa, are rapidly washed away by the flow of blood, and fill the nose with dirty coagula which obscure the field of operation and mask the actual state of affairs. Bellocq's sound is uncalled for, and tight plugging of the anterior nares is painful and often useless.

In all cases the patient should be kept lying down, as cool as possible, with no heavy or tight clothing, and not alarmed. If he lies over on his side, pinches the end of the nose with his own thumb and forefinger, and keeps the nostrils closed for fifteen minutes by the clock, the majority of cases of epistaxis will be arrested without further interference, thanks to the formation of clot, and the direct pressure on the epistaxis area. If this fails, the nose should be cleared of clot by sniffing up warm salt-and-water (3i to Oi) at a temperature of 112° F., while cold water is freely sluiced over the face and neck. If ice is available it is added to the cold affusion, and portions are held in the mouth. Or cotton-wool soaked in lemon-juice, hazeline (Pond's extract), or a solution of antipyrin (gr. xxx to ʒss) can be introduced into the bleeding nostril, which is then compressed with the patient's forefinger for fifteen minutes. These remedies are generally at hand, and can be used without any special instruments. If adrenalin or peroxide of hydrogen is available, either of them is still more effective. These steps will be successful in the majority of cases; and the cotton pledget may be left for twenty-four hours, when the treatment against recurrence can be carried out. Ribbon gauze which has been prepared with adrenalin and dried also acts admirably. It is very convenient for patients who are subject to epistaxis to carry about with them.

If the bleeding persists, as it is only apt to do when it does not arise from the epistaxis area, the practitioner must provide himself with good illumination, a nasal speculum, and some 1-inch-wide ribbon gauze. After applying 5 per cent. cocaine, he carefully packs the nose from the floor upwards and from behind forwards. The gauze should be removed within twenty-four hours. If the bleeding is profuse the gauze is squeezed out of a 10-volume solution of hydrogen peroxide.

The above measures are suggested for cases in which special instruments are not available.

Curative and preventive local treatment.—The following measures should be carried out in the first instance, if the necessary armamentarium is available. The bleeding-point having been defined and arrested by a pledget squeezed out of equal parts of adrenalin and 10 per cent. cocaine, the galvano-cautery at a cherry-red heat is applied, and the bleeding-point sealed up (*see* p. 67). If the vessel supplying this area is seen to be prominent, it should also be destroyed by the cautery (*see* Fig. 64, 4). This is sometimes a little difficult, as it is apt to escape notice on the floor, just behind the vestibule, and also because it may give rise to brisk hæmorrhage if the cautery is applied too hot or detached too suddenly. If the galvano-cautery is not available, a silver probe is heated in a spirit-lamp to a dull red, and used in the same way. Failing these, the point of a stick of nitrate of silver, or some chromic acid, trichloroacetic acid, or pure carbolic acid will prove nearly as effective.

The patient is cautioned against blowing the nose for a few days, till the eschar separates. This is facilitated by the local use of some ointment (*see* p. 62, and Formulæ 74 and 76).

In the case of telangiectases, the galvano-cautery is apt to produce profuse hæmorrhage, and electrolysis (with the positive pole in the telangiectasis) is to be recommended.

In the small percentage of cases in which epistaxis does not originate in Kiesselbach's area, the treatment will vary according to the pathological condition met with. In the rare cases where the uncontrollable bleeding comes from a large area, it might be necessary to strip off some of the mucous membrane of the septum.*

If the hæmorrhage has been severe, rectal or subcutaneous saline injections may be required. If the patient is alarmed, and the circulation agitated, a dose of tinct. opii or a hypodermic injection of morphia will be beneficial.

After-treatment.—If there is decided anæmia, the usual treatment with iron, strychnine, arsenic, rest, air, and food will be indicated. The general causes require their special consideration.

In obstinate cases of epistaxis, and while the blood pressure is being lowered in high-tension cases by absolute rest with low diet and restriction of fluids, along with saline purgatives, iodides, nitro-glycerin, or amyl nitrite, 30 gr. of lactate of calcium twice a day in half a tumbler of water for six doses will often prove effective. In the epistaxis of cirrhosis of the liver it has been

* Hunter Mackenzie, *Lancet*, May 10, 1902.

C. A. Parker, *Proc. Laryngol. Soc., London*, x., Nov. 10, 1902, p. 23.

recommended to mop out the nostril with a pledget soaked in a gelatin-serum solution and then plug it with a tampon moistened with the same mixture :—

R Sodii chloridi	.	.	.	.	gr. xi
Gelatin	.	.	.	.	℥ii
Aq. destill.	.	.	.	.	℥iiiss (Carnot).

INJURIES TO THE NOSE

The external injuries of the nose belong to general surgery. It might be well to recollect that the fleshy end of the nose may be completely detached, and yet, if it is carefully and promptly replaced, perfect union will occur.*

Fractures of the nasal bones and septum.†—These are nearly all the result of direct violence. The chief symptom is epistaxis with swelling of the nose. Unfortunately, the latter so masks the local condition that the exact state of affairs cannot be determined until it has subsided, by which time vicious union has taken place, and the malposition of the fractured bones can only be corrected with difficulty.

One or both nasal bones may be displaced inwards, causing a flat bridge with a sharp ridge on either side (Fig. 66).

Fracture in the **septum** generally takes place in the quadri-lateral cartilage, or at its junction with the vomer or superior maxilla. It may be accompanied by a hæmatoma (p. 157), and the occurrence of epistaxis shows that it is really a compound fracture. Care should therefore be taken not to infect the nostrils, and the patient should be warned on the subject.

The application of cocaine and adrenalin (p. 71) may allow careful inspection of the septum; but as the exact condition of things is masked by swelling, it is nearly always advisable to administer a general anæsthetic.

Crepitus can rarely be made out, and surgical emphysema must not be mistaken for it. A hæmatoma is dealt with as directed (p. 157). If there is any displacement of the septum—and it generally takes place towards the side on which there is already some convexity—or any depression of the nasal bones, the parts should be raised into place by manipulation with the little finger in the nostril; or flat-bladed forceps, like those of Adams, may be used (Fig. 65). One blade in each nostril will straighten the septum, and at the same time raise the whole nose into place. The nasal cavities are then carefully packed with pencils of rubber sponge, compressed cotton-wool, or Bernays' compressed cotton

* J. M. Renton, *Brit. Med. Journ.*, Dec. 16, 1905.

† J. Tremolières, *Ann. des Mal. de l'Oreille*, xxxi., 1910, No. 10, p. 337.

splints. These are sterilized, smeared with vaseline, and changed every twenty-four or forty-eight hours for a week or so. But in neglected cases it may be necessary to refracture the nasal bones, and when these are replaced an external splint may be requisite. This can be made of plaster of Paris, or the outside of the nose may be covered with a piece of heavy adhesive plaster, and outside that a shield of tin, copper, or, preferably, aluminium.*

The **vomer** is rarely fractured, although much callus is often thrown out in the displacements which occur between it and the cartilage. Recent cases require no outside splints. In fact, if the displacement is promptly reduced, under general anæsthesia, the reduced parts will generally maintain their position.



Fig. 65.—Forceps for correcting misplacement of fractured septum.

Fracture of the **ethmoid** is, fortunately, rare. When it occurs, it is apt to run into the cribriform plate, and be associated with the escape of cerebro-spinal fluid, and other indications of fracture of the anterior fossa of the skull.

The correction of the external deformities left by injury to the nose requires much skill and patience.† The use of paraffin injections is described on p. 668 (Figs. 66 and 67).

DISEASES OF THE VESTIBULE OF THE NOSE

The entrance to the nose—that portion extending from the outside to the commencement of the mucous membrane, and commonly known as the vestibule—is not a part of the nasal chamber proper. It is lined with skin, supplied with hairs (*vibrissæ*) and sweat-glands, and is therefore part of the outer integument, in the diseases of which it shares.

Alar collapse.—The patency of the anterior nares is maintained by the lower lateral cartilages, and by the tonus of the

* T. A. de Blois, *Trans. Amer. Laryngol. Assoc.*, 1900, p. 12.

† John O. Roe, *N.Y. Med. Record*, July 1, 1905.

John O. Roe, *Laryngoscope*, xviii., Oct., 1908, p. 782.

Lee Cohen, *ibid.*, xxiv., June, 1914, No. 6, p. 565.

small muscles which raise the corner of the nose, viz. the levator anguli oris and the levator labii superioris alæque nasi. When nasal respiration has been for some time in abeyance, the alæ nasi become collapsed and the anterior nostrils are reduced to slit-like, inactive, expressionless orifices (Fig. 61). If the nasal air-way can be restored, the activity of the alar muscles may be revived by regular breathing exercises, or games and dances in which the mouth is kept closed. One of the best is skipping. Local



Fig. 66.—Depression of the bridge of the nose, the result of an accident.



Fig. 67.—The depression of the bridge of the nose shown in Fig. 66, after correction by injection of paraffin.

massage and faradism can also be employed. When the alar collapse cannot be entirely overcome, and is only troublesome at night, a small piece of rubber drainage-tube, or a Felsbach or Francis dilator, can be worn in the vestibule of the nose (Figs. 68 and 69).

New growths.—Papillomata or warts are not very common in the vestibule of the nose, but they are unsightly and give much trouble in blowing or cleansing the nose (Fig. 70). They are best removed with the galvano-cautery, but can be restrained by

applications of glacial acetic acid or salicylic acid as used in "corn solvents." Arsenic should be given internally.

Dermatoses.—Eczema, sycosis, and other dermatoses of this region must be treated as they would be elsewhere. Fissures are sometimes troublesome. They should be kept dry, painted with argyrol or nitrate of silver, and protected with a mild antiseptic or mercurial salve (Formulæ 75 and 76).

Furunculosis.—A furuncle in the vestibule of the nose is apt not only to be unsightly, but also to cause great pain, as its favourite site is up in the attic of the entrance, where the skin is tightly bound down to the subjacent cartilage, and where it is approached with difficulty. The symptoms are heat, swelling, tenderness, and a shiny redness of the end of the nose. The furuncle will be found in the situation indicated. It should be fomented and bathed with hot water. If discovered in an early stage, I have found that a nasal furuncle can be most satisfactorily dealt with by touching the centre of it with a metal probe tipped with pure carbolic acid. In a later stage, if "pointing," it should be incised.

The patient should be warned against re-inoculating himself, and avoid the habit of pulling out the vibrissæ. As a preventive measure, the vestibule may occasionally be smeared with a little moistened bicarbonate of soda; and, on any sign of a pustule forming, yeast, or furunculin (yeast powder), or ceridin pills (yeast fat) may be given. If subject to repeated boils, the patient may require a staphylococcic vaccine.

Abscess.—An encysted abscess of the lobule of the nose is generally due to auto-inoculation with *Staphylococcus pyogenes aureus*. There are redness, heat, and swelling around one vestibule, and an abscess forms which is smooth, round, shining, and as big as a cherry. Symptoms are not acute, and at the end of six to eight days there is fluctuation. The treatment consists of a free or crucial incision, extrusion of about a thimbleful of pus, and drainage of the cavity with a wick of gauze.*

* Trétrôp, *Presse Oto-laryngologique Belge*, Mai, 1905, No. 5.



Fig. 68.
Felsbach dilator.

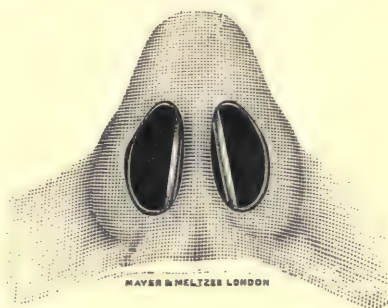


Fig. 69.—Francis nasal dilator.

CONGENITAL OCCLUSION OF THE NOSTRILS

I. CONGENITAL OCCLUSION OF THE ANTERIOR NARES

Occlusion by a congenital web of skin at the junction of the vestibule with the nasal chamber proper is met with very rarely. It may be partial or complete, and unilateral * or bilateral.† These cases do not, as a rule, lend much support to the frequently quoted experiment of Ziem, in which occlusion of the nasal passage in young animals led to septal deviation, deformity of the palate, crowding of the teeth, curvature of the spine, and defective development of the superior maxilla.



Fig. 70.—Papillomata of the nostrils.

From a female aged 22, showing papillomata of the skin lining the vestibules of the nose. The drawing also illustrates a method of inspecting the front of the nasal cavities.

Operation.—If the web obstructing the nostril is thin and membranous, and of low vitality, a simple and effective method is to destroy it with the galvano-cautery. It is best to spread the treatment over several sittings, so as to diminish the local reaction. The application of cocaine may not be sufficient to numb the pain, as the tissue of the obstructing web is more allied to skin than to mucous membrane. It should therefore be punctured quickly in two or three places with a sharp cautery-point, raised to nearly a white heat. If the patient is nervous it may be well to administer nitrous-oxide gas. The orifice is kept distended, until healing takes place, by wearing a

Mayer's vulcanite tube (Fig. 90), or short lengths of full-sized rubber drainage-tube, or nasal dilators (Figs. 68 and 69, p. 119), well smeared with boric, aristol, zinc, or similar ointment. The nasal dilator is changed once or twice daily, and the nostril well cleansed on each occasion.

If the web obstructing the anterior naris is more fleshy in character—and it is more apt to be of this nature when it is incomplete—it is necessary to remove it with a knife. So as to leave as much epithelial tissue as possible, and avoid retraction, the operation is done as follows, under local or general anæ-

* P. Watson Williams, *Proc. Laryngol. Soc., London*, iv., Dec., 1896, p. 32.

† A. H. Cheate, *ibid.*, ix., April, 1902, p. 98.

thesia: A narrow, sharp-pointed knife, such as a Graefe or other ophthalmic scalpel, is used to puncture the obstructing web from before backwards, and it is then made to sweep round the obstructing web, while gradually cutting its way towards the central lumen. The tongue of skin thus formed can be used as a graft to cover most of the raw surface.

The restored anterior aperture is kept patent, as already described, till healing takes place.

In some cases the following operation has been shown to be easy and effective. An incision is made at the junction of the web with the septum, keeping close to the latter and passing straight down to the floor of the nose. On the outer side a similar incision is made, but sloping somewhat outwards. The flap formed between these two incisions is not cut off, but is bent backwards and fastened to the floor of the nose by a single horsehair stitch.*

2. CONGENITAL OCCLUSION OF THE POSTERIOR CHOANÆ

This is a comparatively rare condition, due to defect in development.

Pathology.—The obstruction is situated at the posterior choanæ, and is found to consist of bone, or partly of membrane and partly of bone. The bony diaphragm is the more common. It may be unilateral or bilateral. It may be complete, or a small opening may exist in it. It is a vestigial structure, being the persistence of the bucco-nasal membrane. This form of stenosis is apparently more frequent in females.

Symptoms.—Mouth-breathing and inability to clear the nostril are the chief complaints. There is loss of smell in the obstructed nostril, and if both are occluded the hearing may be interfered with. In one of my cases the mother had noticed that she could only nurse the child when it was lying on the obstructed side (so that the patent nostril did not get blocked by gravity). There is sometimes a little asymmetry of the face in bilateral occlusion, but there is not the marked atrophy and arching of the palate said to occur when one nostril is artificially occluded in young animals. Charles W. Richardson is of opinion that this congenital deformity is responsible for no small proportion of cases of asphyxia neonatorum.

Examination.—The impervious nostril is seen to be filled with a thick, tenacious mucus, which the patient is unable to blow out, and is generally compelled to remove by syringing. The cavity is more spacious than usual, due to the ill-developed

* G. K. Grimmer, *Proc. Royal Soc. Med.*, Laryngol. Section, April, 1908.

condition of the turbinals. The mucosa is pale, sodden, inelastic. If the obstruction is visible from the front it is seen to be pale and grey. In the postnasal mirror it may appear pinkish, and is often dimpled at one point (Fig. 71). A probe will reveal the exact situation and completeness of the partition.



Fig. 71.—Congenital occlusion of the left posterior choana.

The condition is represented as viewed in the postnasal mirror. Note the dimpling near the centre of the occluding diaphragm.

Treatment.—The diaphragm must be well broken through, otherwise it is apt to re-form. But this will not take place if the patient is placed under a general anæsthetic, and, with the left forefinger as a guide in the postnasal space, the surgeon breaks it down thoroughly with a Krause trocar (Fig. 137, p. 266), an antrum drill (Fig. 131, p. 260), an electric dental burr, a nasal punch-forceps, or a chisel and hammer. With a short pair of adenoid forceps (Fig. 188, p. 338) a small piece should then be nipped out of the posterior margin of the septum. A

simple alkaline nose-lotion is, usually, the only after-treatment required; but the posterior nares should be inspected regularly for some months, and any tendency to closure can be met with gauze plugging or by clipping the edges of the choana with sphenoidal punch-forceps (Fig. 164, p. 303).

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CHAPTER VIII

INFLAMMATORY DISEASES

ACUTE RHINITIS

Synonyms.—*Acute nasal catarrh; coryza; cold in the head; acute rhinorrhœa.*

Definition.—An acute inflammation of the mucous membrane of the nose, lasting from five or six days to three weeks or more.

Etiology.—Acute rhinitis is the most common manifestation of a catarrhal infection (*see* On 'Taking Cold,' p. 101). Symptomatic acute rhinitis is one of the prodromal symptoms of influenza, measles, scarlatina, whooping-cough, enteric, typhus, smallpox, chickenpox, secondary or congenital syphilis, and glanders. These infections are apt to be acute, to invade the sinuses, and to leave behind them supuration, atrophy, scars, or adhesions. In diphtheria and erysipelas not only may there be a rhinitis, but the specific process may itself invade the nose. Gonorrhœal rhinitis is sometimes very severe, but is rarely seen in adults. The gonococcus can sometimes be demonstrated in the purulent rhinitis of infants.

Rhinitis may be set up in those exposed to local irritants, as millers, furriers, sawyers, tobacco-workers, ivory and steel turners, decorators, and housemaids. Locally the vapours of iodine, bromine, chlorine, ammonia, and fuming mineral acids, as well as dust and fogs, will give rise to it. A destructive form may occur in workers in bichromate of potash, mercury, arsenic, or osmic acid. Rhinitis may occur in connexion with the administration of iodide of potassium, arsenic, or other drugs, and will disappear when the use of the toxic agent is discontinued. It is predisposed to by all obstructive affections of the nose and postnasal space. Chronic hypertrophic rhinitis, deformities of the septum, polypi, and chronic empyemata conduce to the contraction and exacerbation of acute nasal catarrh; and frequent rhinitis in children is generally due to naso-pharyngeal adenoids. Indeed, a large majority of children who are reported to be always catching a "cold in the head" will be found to possess inflamed or overgrown pharyngeal tonsils. Other causative factors are described in the chapter On 'Taking Cold' (Chap. vi., p. 101).

Symptoms.—Acute rhinitis is such a common complaint that the symptoms only require a brief description. They are ushered in with malaise, and a slightly febrile reaction, to be speedily



Fig. 1.—Papillary hypertrophy of the posterior extremities of the inferior turbinals, as seen in the postnasal mirror. (*See p. 131.*)

Fig. 2.—Choanal or postnasal polypus, as seen by posterior rhinoscopy in the left choana. (*See p. 343.*)

Fig. 3.—Crusting, atrophic catarrh, as seen by posterior rhinoscopy in the postnasal space, and, as a matter of fact, due to suppuration in the right sphenoidal sinus. (*See pp. 356 and 299.*)

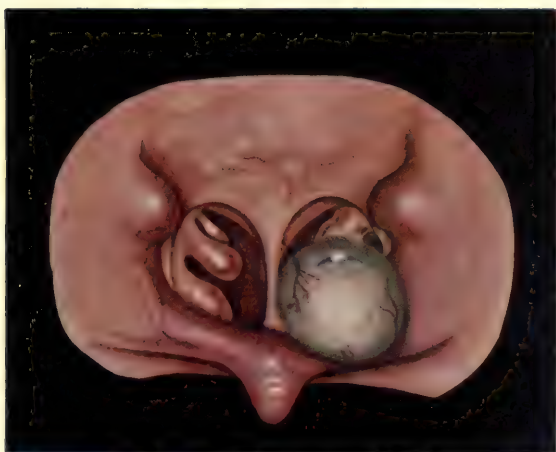
(*From Grünwald's "Atlas and Epitome of Diseases of the Mouth, Pharynx, and Nose."*)

PLATE III.

1



2



3



followed by a sense of stuffiness in the nose, sneezing, lachrymation, and a discharge which is at first watery and acrid, and later on mucopurulent. The nasal chambers become more or less completely obstructed, and this induces headache, anosmia, impairment of that part of taste which depends on the olfactory nerve, mouth-breathing, and secondary pharyngitis and laryngitis. The discomfort of the obstructed nose and dry mouth always becomes much worse at night, and may render sleep broken and unrefreshing, while children who have not acquired the habit of mouth-breathing will even struggle for breath and suffer from attacks of laryngismus stridulus (cf. pp. 320 and 507). There is often a sense of stuffiness in the ears, with some deafness and occasional tinnitus. By losing its chief resonating chamber the voice assumes a so-called "nasal" tone. The temperature may be slightly raised.

On inspection, the upper lip is often found excoriated by the acrid discharges, the *alæ nasi* are red and thickened, and the conjunctivæ are seen to be injected. The mucous membrane of the nasal cavities is of a dark-red colour, and the inferior turbinals are so swollen as to occlude the nasal passages. When touched with a probe their surface is found to be elastic, and can be indented like an air-cushion, but the depression formed at once fills up again. When mopped with a 5 per cent. solution of cocaine the engorged tissues retract, and a deeper view can be obtained. This restoration of the nasal air-way is only temporary, and is followed by a more marked turgescence. It is of value, however, as the more complete inspection helps in confirming the diagnosis. The discharge will vary in quality and amount according to the stage of the attack.

Complications.—Examination will generally reveal an inflamed condition of the postnasal space, and it is not uncommon for the catarrh, in a mitigated if not acute form, to extend to the lachrymal sac, the pharynx, larynx, and trachea. Any of the accessory sinuses of the nose may become infected, and extension may take place through the Eustachian tube to the middle ear. These latter complications are particularly apt to occur when the acute rhinitis is associated with influenza.

Complete nasal obstruction in nursing infants may constitute a serious condition, so greatly will it interfere with suction. This must be replaced by spoon-feeding.

Pathological anatomy.—The epithelium shows but slight modifications; the cilia may be absent, and in some spots the superficial stratum may be missing. In the substrata there is intense cellular infiltration.*

* Seifert, *Müsch. med. Woch.*, June, 1904.

Diagnosis.—This seldom presents any difficulty, except in the case when the coryza is the prodroma of one of the specific fevers, most commonly measles. The diagnosis can then be made by the more marked symptoms, higher fever, and the presence of other indications. From erysipelas it is distinguished by the gravity of the latter affection or the erysipelatous hue of the nose externally. A foreign body produces one-sided symptoms. In hay-fever there is no fever, and the patient readily recognizes the similarity of his subjective symptoms to those of previous attacks. Iodism is associated with cutaneous papules, and produces a generalized catarrh which will cease on withdrawal of the drug.

Prognosis.—In uncomplicated cases this affection will generally subside spontaneously in five to fourteen days. But treatment should not be neglected, as it undoubtedly lessens the discomfort and duration of the disease, tends to prevent complications, and may help in avoiding recurrences. Besides, the impaired local and general resistance consequent on a "common cold" predisposes to many disorders.

Treatment.—The general treatment has been described elsewhere (p. 107). As regards local relief, it is not well to be too meddlesome at first. The popular custom of snuffing up brandy and lemon-juice can only aggravate an acute inflammatory condition. Adrenalin, often prescribed on theoretical principles, may prove irritating, and the temporary ischæmia may be followed by increased turgescence. The patient should inhale some carbolic smelling-salts, spirits of chloroform, a saturated solution of camphor in alcohol, a dry inhalation of menthol, or simply hold a piece of camphor in the hand and occasionally smell it. Temporary relief, if imperative, can be secured by painting or spraying the nose with a 2-5 per cent. solution of cocaine (Formula 2). It should be used with care in children.

A good plan in the early obstructive stage is to order a warm steam inhalation of camphor or benzoin (Formula 13 or 17), to be used every hour, while the upper lip is protected by vaseline, and a small piece of menthol ointment is introduced into the nostrils and snuffed up (Formula 74). Once the secretion becomes loose its discharge is facilitated by a simple alkaline lotion (Formula 8). If resolution is not complete, and the turbinal infiltration threatens to become chronic, the use of chromic acid or careful use of the galvano-cautery might be indicated (p. 67).

The general and preventive treatment comprises attention to the various matters referred to in the chapter On 'Taking Cold' (p. 101).

SIMPLE CHRONIC RHINITIS

Synonyms.—*Chronic coryza*; *chronic catarrh*.

Definition.—A chronic catarrhal condition of the nose.

Although one of the most common of nasal affections, the definition of chronic rhinitis is uncertain and vague, including, as it may do, anything from the remains of an acute coryza up to an established hypertrophic rhinitis.

Chronic rhinitis will usually disappear with the removal of the cause, but may persist until hypertrophic changes have taken place in the nasal mucosa. It is generally a secondary affection, associated with some constitutional condition, or some nasal obstruction, or a pyogenic process in the accessory sinuses or postnasal space.

Pathology.—There is engorgement of the vessels with commencing inflammatory changes in the mucosa. The condition is not infective. The rôle played by micro-organisms is not well determined. In the simplest form of chronic rhinitis ordinary staphylococci, not virulent, are found in the anterior segment of the nose. If the secretion is irritating, producing sycosis, virulent *Staphylococcus aureus* is met with.*

Etiology.—Chronic rhinitis may be the legacy of an acute attack, or of a succession of mild attacks, of coryza, or may be left after measles, scarlatina, or other specific infection. It is frequently met with in those exposed to dusty occupations—stonemasons, millers, furriers, tobacco-workers, or upholsterers. Chronic rhinitis forms part of the symptom-complex of any chronic affection of the nose, postnasal space, or accessory sinuses. The most common cause in childhood is inflamed adenoids, while in adults sinus suppuration is often overlooked as the etiological factor. Among the predisposing causes are those enumerated under the heading of catarrh (p. 101). Any deformity of the nasal chamber may conduce to the affection, particularly marked deviation or spurs of the septum. It is twice as common in men as in women, and it is more common in children than in adults. It is rare in old age.

Symptoms.—The most prominent symptoms of this condition are obstruction, and nasal or postnasal catarrh. The obstruction is seldom so complete as in other forms of rhinitis. It is generally intermittent, being worse after meals, in certain conditions of weather, and at night. Indeed, while through the day the condition may be almost negligible, at night the nostrils become so obstructed that mouth-breathing with all its discomforts is necessary. Gravity appears to increase the trouble, the lower nostril being generally the worst. The obstruction may diminish under the influence of cold, a sudden entry into dry air, or the effects of emotion.

* E. Guérin, *Rev. Hebd. de Laryn.*, xxv., 1904, No. 36, p. 273.

The secretion, generally odourless, varies from a slight increase of the normal to profuse, thick, tenacious mucus, muco-pus, or inspissated masses of secretion. In some cases the discharge tends to flow backwards and produce the symptoms of postnasal catarrh.

The general symptoms vary with the individual. The victims of chronic rhinitis were divided by Lermoyez into the two well-marked classes of (*a*) the indifferent and (*b*) the hypochondriac. But, with increased knowledge of the causes which lie at the root of the affection, we generally find that the patient's complaints are well founded, and the various symptoms possible in nasal disease must be kept in mind (p. 92).

Examination.—The secretion will sometimes be found stretching from one side to the other of the nasal chamber, or else accumulated on the floor or under cover of the inferior turbinals. The mucous membrane is swollen, sometimes to such an extent that the inferior turbinal is in contact with the septum, and no thorough inspection is available without the use of cocaine (p. 75). The mucous surface may be pale and sodden, or bright-red and elastic-looking. The use of the probe will show that there is neither œdema nor true hypertrophy, and that the instrument makes only a temporary depression on the surface, as it would do on an air-cushion.

The septum is somewhat congested and velvety-looking, and the middle turbinal frequently appears enlarged and shiny. But as chronic rhinitis most commonly occurs in the victims of hypertrophic and purulent rhinitis, or of affections of the nasopharynx, the changes accompanying these conditions may also be met with.

The examination would be incomplete without an inspection of the pharynx and postnasal space, which will be found injected and catarrhal. The posterior ends of the inferior turbinals are not enlarged unless they are already subject to chronic hypertrophy, but they will be seen to be shiny, succulent-looking, and pinkish instead of grey.

Finally, a thorough inquiry may be necessary into the patient's habits, hygiene, and way of life, and a complete physical examination completed, before the etiological origin can be settled.

Complications.—The possible sequelæ are described under the heading of Symptoms of Nasal Disease (p. 92).

Diagnosis.—In the simple form of chronic rhinitis the diagnosis is arrived at by noting the more or less bilateral form of the affection, and the absence of gross lesions, ulceration, bleeding surfaces, bare bone, or pure pus. The condition of the accessory sinuses and of the postnasal space always requires investigation.

Treatment.—(See Treatment of Catarrh, p. 107.) This should be both (a) general and (b) local.

(a) **General treatment.**—The avoidance of an unhealthy atmosphere, as with workers in cement factories, carpet warehouses, or tobacco manufactories, may be indicated, and the patient's habits in regard to alcohol, food, tobacco, air, and exercise may require regulating.

Mechanical hyperæmia may be maintained by disorders of the digestive tract, the heart, the liver, the uterus, or the kidneys. It has been suggested that a diminution of the amount of salt taken with food might decrease the saline nasal flux.*

Some general disease may be the first, and possibly the only, thing requiring attention, such as diabetes, albuminuria, a pre-tubercular condition, gout, or anæmia.

In treating neurotic subjects it is unwise to aggravate the attention they give to their nasal catarrh by unduly increasing local medication. General treatment—massage, hydrotherapy—will frequently prove of benefit, as well as some form of outdoor exercise. Bicycling is apt to induce mouth-breathing and increase the nasal catarrh, at least temporarily. It is in the case of neurotic subjects, or those whom it is desirable to wean from a habit of over-drugging their nose, that a visit to some health resort is often indicated. According to the nature of the case, we may have to recommend sulphur (Harrogate, Aix, Luchon, Cauterets), arsenical (Mont Dore, La Bourboule), saline (Ems, Royat, Vichy, Homburg, Carlsbad), or iron springs (Spa, Schwalbach, St. Moritz).

(b) **Local treatment.**—It is important to individualize our treatment in all nasal affections, but particularly so in chronic rhinitis. Sometimes no local treatment at all is required.

The first thing to do is to see that the nose is satisfactorily and regularly cleansed (p. 56). All sniffing or hawking should be interdicted, and violent use of the handkerchief must be avoided as it only increases the local congestion. If the nasal thoroughfare is so obstructed by swelling or tenacious mucus that it is impossible to clear it, we must facilitate matters by the use of some cleansing lotion (p. 56), and the application of a suitable pomade to the nostrils (p. 62). Such simple measures, with attention to the matters mentioned in Chap. VI. (p. 105), will generally be sufficient to cure most ordinary cases. Further help may sometimes be obtained by the use of oily sprays after the mucus has been removed (p. 61). Where a condition of vaso-paresis appears to have been induced, benefit might be obtained by vibratory massage. But the use of astringents, such as zinc and alum, should

* L. Jacquet, *Ann. des Mal. de l'Oreille*, xxx., 1904, p. 193.

be avoided; they irritate the sensitive nasal mucosa, are badly borne, and endanger the sense of smell. Powders are also irritating and useless. The practitioner should be put on his guard against ordering any preparations containing cocaine. The relief this drug secures is only temporary, and the retraction it brings about is followed by a still more marked vaso-paresis (p. 71).

It must be remembered that nasal lotions are only intended and expected to cleanse the nose of superfluous, stagnant secretion, and should even then be discontinued as soon as possible. They should not be used if this is not present, otherwise they only wash away the protecting mucus, diminish the sense of smell, and conduce to the development of hypertrophic rhinitis.

Insufflation of superheated air, according to the method of Lermoyez and Mahu,* is said to give good results in those cases where the vaso-motor element is most marked as an etiological factor. As a rule, six to eight applications are made every two days. Then, after a fortnight's rest, another series of four to six treatments may be given, each one lasting, at a maximum, one minute for each nostril.

If the turbinals are still found to be flaccid or intumescent, or approaching a condition of hypertrophic rhinitis, it will be necessary to reduce them by the use of some caustic (p. 67). Trichloroacetic acid is the mildest chemical caustic, and chromic acid is useful. They should be applied in one streak along the inner or lower border of the inferior turbinal. The galvano-cautery is best applied in the same way, i.e. by drawing the cautery from behind forwards. Or the extremity of the electrode may be buried deeply in the mucosa at several points of the turbinals. Or a fine needle-like electrode is thrust through the mucosa and passed backwards so as to produce a submucous burn—the object in all cases being to gain the desired effect with as little destruction as possible of the secreting surface. Any persistent thickening on the septum may be touched with one of these caustics.

When the cause is found to be dependent on obstruction in the nasal air-way, affections in the postnasal space, or disease of the accessory sinuses, they will require treatment. In nine cases out of ten the chronic nasal catarrh of children is cured by removing their adenoids (Lermoyez).† The ethmoiditis of adults, particularly when, as often occurs, it is bilateral, is frequently at

* Lermoyez and Mahu, *Ann. des Mal. de l'Oreille*, xxvi., Juillet, 1900, No. 7, and xxix., 1903, No. 3.

Lermoyez and Mahu, *Rev. Hebd. de Laryngol.*, 4 Mars, 1905, No. 9, p. 241.

Bourgeois, *Ann. des Mal. de l'Oreille*, xxxii., 1906, No. 3, p. 264.

Lichtwitz, *Arch. Internat. de Laryn.*, xiv., 1901, pp. 35 and 103.

J. C. Beck, *Laryngoscope*, xiii., May and July, 1903, pp. 368 and 537.

† *Ann. des Mal. de l'Oreille*, xxxiii., Déc., 1906, p. 517.

the root of an apparently obstinate catarrh. This is apt to escape detection when not associated with pus or visible polypi. It will be described later.

(As hypertrophic rhinitis is often found associated with chronic rhinitis, the following section should be consulted at the same time.)

HYPERTROPHIC RHINITIS

Definition.—Chronic nasal catarrh, characterized by thickening of the mucous membrane.

Etiology.—This condition is more frequently met with in men than in women. It is produced by the same causes as acute and chronic rhinitis. Any chronic obstruction of the nasal air-way, such as that caused by deviations, spurs, adenoids, and congenitally narrow nasal chambers, leads to hypertrophy of the mucous membrane. When one side of the nose is much wider than the other, compensatory hypertrophy usually develops in the middle and inferior turbinals of the roomy nostril. It is sometimes met with in the anæmic, but is then probably as often a cause as a consequence. It has been attributed to gout and rheumatism. It is frequently associated with a neurotic type, and is apt to be met with in those who are broken down in health, especially those who lead an indoor life. The Jewish race seems to be prone to it. It "runs in families," often only in the male members, and is apt to be met with in those who have a family history of asthma, emphysema, and chronic bronchitis. Hypertrophy of the inferior turbinals, as well as of the uvula and fauces, is sometimes seen associated with myxœdema.*

Pathology.—The changes found are those of a chronic inflammatory process. The epithelial layers are increased, the upper ones becoming more cubical or flattened, and ciliated cells only remain in places. The vessels are dilated and thickened, and surrounded by a small-celled infiltration.† There is consequent increase of the interstitial tissue, and, as this seldom occurs uniformly, a polypoid formation takes place by which the surface is thrown into an irregular, papillary, rugose-shaped or polypoid condition.‡ This chiefly takes place on the inferior turbinal, the anterior extremity being sometimes so hypertrophied that it can be displaced by a probe (Fig. 72). Along the lower margin it is generally more diffused, but hypertrophied masses are often concealed under cover of its concavity (Fig. 73). The posterior extremity is also frequently affected. The smooth pinkish posterior extremity may develop a mulberry surface, and more or less completely occupy the lower half of the choana (Fig. 75). This condition has been studied by Wyatt Wingrave, who

* Connal, *Glasgow Med. Journ.*, Oct., 1898.

† Citelli, *Arch. f. Laryngol.*, Bd. xiii., Heft 1 (full abstract in *Laryngoscope*, xii., 1902, p. 720).

‡ L. H. Pegler, *Proc. Laryngol. Soc., London*, ii., 1895, p. 84.

has given it the name of turbinal varix.* The anterior end of the middle turbinal also becomes polypoid; and it has been demonstrated by Bryson Delavan that the bone in both the inferior and middle turbinal shares in the hypertrophy † (Fig. 74).

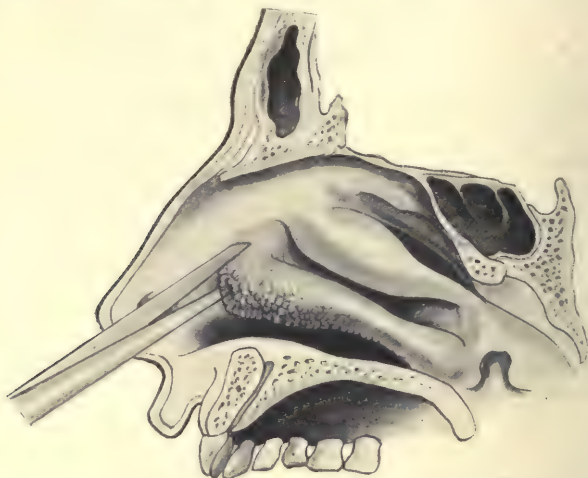


Fig. 72.—Cutting through the attachment of the inferior turbinal to the outer nasal wall, as a first step in the removal of polypoid hypertrophy.

The floor of the nose is rarely affected. The septum may show a diffuse hypertrophy in the region of the tuberculum, and more or less symmetrical thickenings on each side of the posterior margin

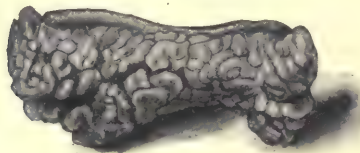


Fig. 73.—Polypoid hypertrophy removed from the lower border of the inferior turbinal. (*Life size.*)



Fig. 74.—Cyst of the middle turbinal.

may be seen by posterior rhinoscopy.‡ These various thickenings are of a dark purplish colour, or of a sodden grey-white appear-

* *Journ. of Laryngol.*, 1894.

† *Arch. of Laryngol.*, iii., 1882, No. 3.

‡ L. H. Pegler, *Journ. of Laryngol.*, xii., 1897, Nos. 9 and 12.

J. Dundas Grant, *Proc. Laryngol. Soc., London*, i., Nov., 1893, p. 38.

W. Hill, *ibid.*, ii., Jan., 1895, p. 34.

ance, from thickening of the epithelium and connective tissue. The hypertrophies of the posterior ends of the inferior turbinals, and of the choanal edge of the septum, generally present a dull-grey appearance in the postnasal mirror. (Plate II., Fig. 1, facing p. 124.)

Symptoms.—The principal complaint is of nasal catarrh, the secretion being abundant, thick, sometimes muco-purulent, and occasionally stained with blood if much force has been used in expelling it. At times it may have a faint smell, or impart a slightly sickly odour to the breath. The other chief symptom is that of nasal obstruction, worse at night, and influenced by gravity, so that the lower nasal chamber in the lateral decubitus is the most obstructed. The obstruction may be sufficient to induce mouth-breathing with all its consequences (cf. Chap. v., p. 92). The sense of smell is diminished, and hence much of what is often attributed to taste is lost. The voice loses its nasal resonance and becomes thick and woolly. If the process affects the back of the nasal chambers, the discharge will tend to pass into the pharynx, and the symptoms will be chiefly those of postnasal catarrh. Hawking and hemming will then be more frequent, and an irritability will be produced which may excite vomiting. The catarrhal process is apt to spread to the Eustachian tubes, producing the symptoms of Eustachian collapse, and even catarrh in the middle ear. By direct spread, the inhalation of discharge, or the mouth-breathing induced, catarrhal symptoms may be found in the pharynx, larynx, trachea, and bronchi. Asthma or hay-fever is often associated with hypertrophic rhinitis. Disorders of the lachrymal tract and the eye, headache, many of the symptoms of aprosexia (p. 95), and various reflex symptoms, such as sneezing, coughing, sighing, neuralgia, asthma, aphonia, and laryngeal spasm, are at times attributable to it.

The acidity of the secretion may cause eczema of the nares, and some cases of congestion and thickening of the skin of the end of the nose are shown to depend on the state of the nasal mucosa.

Examination.—The nasal chambers should be inspected both by anterior and by posterior rhinoscopy. The nose should then be cleared, either by washing it out (p. 56) or simply by asking the patient to blow it; and, finally, the investigation is completed by the use of cocaine (p. 71), and exploration with the probe (p. 20). This plan enables us to detect the origin of a discharge within the nose, and to compare the condition of things before and after the use of cocaine. The first thing which meets the eye is the smooth, dull pink swelling of the anterior extremity of the inferior turbinal. The rest of the turbinal may show either a diffused or a

circumscribed hypertrophy. The latter is common at the posterior extremity and in the concavity. A diffuse hypertrophy, but with a papillary surface, is common on the anterior extremity and under-surface of the middle turbinal. It may be dull-red or purplish in colour, or even a translucent grey, as in polypus formation. Its true character is revealed by the probe. The appearances of the septum and posterior extremities of the inferior turbinal when affected by hypertrophy have been described under the heading of Pathology (p. 131). (Fig. 75, and Fig. 120, p. 246.)

Diagnosis.—A simple hypertrophy can generally be distinguished from other conditions by remembering the bilateral nature of the affection (although possibly more pronounced on one side than the other), the absence of pain, epistaxis, ulceration, fetor, or distinctly purulent discharge, and the chronic nature of the

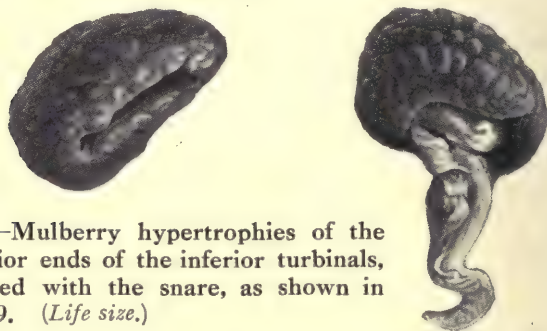


Fig. 75.—Mulberry hypertrophies of the posterior ends of the inferior turbinals, removed with the snare, as shown in Fig. 79. (*Life size.*)

complaint. The presence of other affections, particularly new growths and diseases of the accessory sinuses, must be carefully sought, as well as indications of any chronic infective disease, such as syphilis or tubercle. The presence of pus, particularly if one-sided, should prompt a careful examination of the accessory cavities.

Prognosis.—Hypertrophic rhinitis, when untreated, tends to persist indefinitely.

Treatment.—The nasal chambers should be cleansed as often as is necessary (for methods, *see* pp. 56 to 60), and the nasal toilette may sometimes be completed by spraying in some bland simple oil, such as liquid paraffin or parolein. This may be medicated in various ways, but it must never be forgotten that all antiseptics are somewhat irritating, and therefore stimulating. The local use of caustics may be sufficient to give relief and check progress, if the hypertrophy is in an early stage. This

can be determined by the application of cocaine. If painting with a 10 per cent. solution of cocaine produces some, though not complete, shrinkage of the nasal hypertrophy, and if the surface has not yet become distinctly rugose or papillary, then trichloroacetic acid, chromic acid, or the galvano-cautery can be employed, as described on pp. 67 and 130. For a general hypertrophy of the inferior turbinal, the best result is generally obtained by making one narrow but deep score from behind forwards along its centre. The cautery-point may also be applied to any thickening on the septum, and, introduced through the nose, its application to the enlargements of the posterior end of the inferior turbinals, or thickenings on the posterior margin of the septum, can be carried out under observation in the postnasal mirror.

The galvano-cautery should be used with discretion. It destroys a certain amount of epithelium, and the steam and heat it diffuses produce reaction in the surrounding tissue and make it difficult to limit its area of action. Besides, extensive use of the galvano-cautery is never called for. When marked hypertrophy is present, as shown by the mulberry surface and the slight amount of retraction produced by cocaine, it is better to remove it by the cold-wire snare, scissors, or punch-forceps. These remove only redundant tissue of no physiological use, leave a clean wound, and produce less local reaction; hence there is not so much risk of adhesions or other complications.

The snare is often sufficient to embrace and remove large hypertrophied masses from the lower border of the inferior turbinal. The anterior end, when enlarged, should first be separated from the outer wall by scissors (Fig. 72), and then cut away with the Krause, Blake, or Lack snare, threaded with No. 5 piano-wire. This proceeding will also give better access to polypoid masses tucked away in the concavity of the inferior turbinal. If the whole inferior border is affected (Fig. 73), it can be detached in one mass with nasal scissors, but a pair of polypus forceps should be at hand to seize and remove the growth when it remains attached posteriorly. The anterior end of the middle turbinal is removed in the same way (Figs. 76 and 77), but, as bone has generally to be included, it will frequently be found that the wire snare slips off the rounded head, which should then be seized and removed with Grünwald's or Luc's punch-forceps (Figs. 78 and 114). The spokeshave is seldom employed in the finer nasal surgery of the present day. It is sometimes useful for shaving off the hypertrophied lower border of the inferior turbinal (Fig. 73).



Fig. 76.—Amputation of the anterior end of the middle turbinal: dividing the attachment to the outer nasal wall. First step.

Hypertrophies of the posterior end of the inferior turbinal require some skill to remove satisfactorily. Even with the nose carefully anæsthetized, the loop of spring wire is very disagreeable

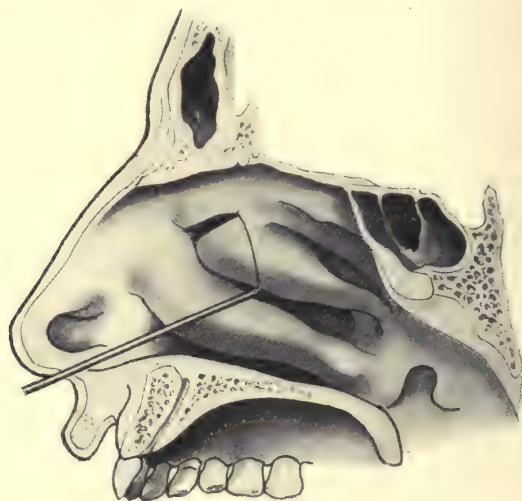


Fig. 77.—Amputation of the anterior end of the middle turbinal: removing the separated extremity with a wire snare. Second step.

to the patient ; the field of operation is not under direct inspection ; and there is much difficulty in securing the wire noose around the soft, slippery hypertrophy. This can sometimes be effected by suitably preparing the wire loop beforehand. The operator introduces his left forefinger into the postnasal space, and there guides the wire loop around the hypertrophy, while the barrel of the snare is pressed down until the growth is gripped (Fig. 79). If the surgeon is deft, this somewhat disagreeable procedure can be carried out very quickly. Once the snare has firm hold of the hypertrophied end, it should be left in place some minutes to allow of blood-clotting. Bleeding is also prevented, and the hypertrophied



Fig. 78.—Grünwald's punch-forceps.

end more thoroughly removed, if the snare is not used to cut it through, but is employed to grasp it firmly so that by a quick movement of avulsion the hypertrophy is plucked off. Hæmorrhage may be very sharp at first, but the patient can be assured that with the usual precautions it will soon cease (*see* p. 83).

Under a general anæsthetic, of course, this procedure is more easily and sometimes more readily carried out with a pair of polypus- or punch-forceps introduced through the nose, and guided with the finger in the postnasal space. If a general anæsthetic is employed, all hypertrophied masses on both sides can be removed at one time. With cocaine two or more sittings may be required, and an interval should be allowed to elapse after any removal to give the good effects time to develop, so that not more tissue may be removed than is necessary.

Removal of the middle turbinal has no marked ill effect on the filtering functions of the nose. But the inferior turbinal should never be entirely removed, and "complete turbinectomy" with the spokeshave has now been quite superseded by a judicious employment of the partial removals described. Submucous

resection of deformities of the septum has also supplied us with a satisfactory method of correcting nasal obstructions while preserving physiologically important mucosa, so that there is no longer any need to sacrifice all the valuable secreting surface of an inferior turbinal. In some cases, where the inferior turbinal has been too freely removed, the loss of its moistening and filtering action and undue patency of the nostril produce the discomfort of dry

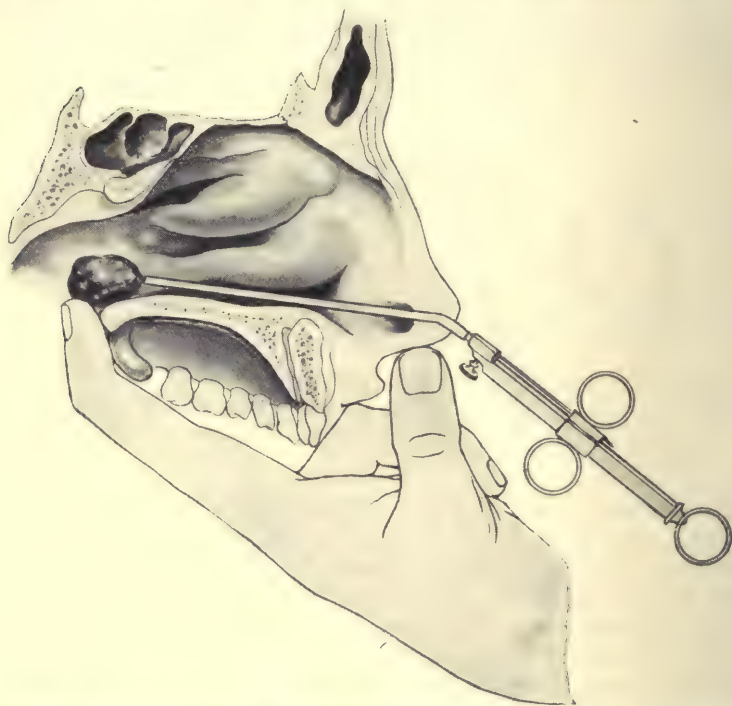


Fig. 79.—Amputation of the posterior end of the left inferior turbinal.

pharyngitis and laryngitis, with difficulty in expelling stagnant secretion from the nose. The loss of the turbinal may lead to a condition simulating atrophic rhinitis, or even ozæna.*

Markedly polypoid tissue has, of course, ceased to be physiologically of value, and should be removed; but the attached base of the inferior turbinal is seldom diseased, and, if this is left, a good deal of the spongy body is healthily regenerated.† When

* W. R. H. Stewart, *Proc. Laryngol. Soc., London*, v., March, 1898, p. 57.

† W. Hill, *Proc. Laryngol. Soc., London*, iii., Nov., 1895, p. 15.

a normal turbinal has to be removed in part, as in deflections of the septum (p. 176), or radical operations on the maxillary sinus (p. 264), there is no fear of these sequelæ if at least half of the body is left behind.

When the obstruction appears to be chiefly caused by enlargement of the inferior turbinal, and where removal of redundant mucous membrane would not give sufficient relief, good results can be obtained by performing a submucous resection of the bone on the lines indicated for correcting deviations of the nasal septum (*see* p. 170). The preserved muco-periosteum forms a miniature turbinal.*

After-treatment.—The nose should be left undisturbed for forty-eight hours. Blood-clots and mucus should then be expelled by blowing (*see* p. 56), and a simple alkaline nose lotion (Formulæ Nos. 8 and 11) with oily spray or some nose ointment is ordered. The general and hygienic treatment should be carried out on the lines described for acute and chronic rhinitis (pp. 107 and 129).

Results.—The results of treatment are satisfactory. In some patients, in spite of patent nostrils, there is an occasional tendency to limited recurrences, and a catarrhal condition may require the continued use of a simple nose lotion (Formula 8). The general and health-resort treatment mentioned in the earlier part of this chapter may also be indicated in this condition (p. 129).

RHINITIS SICCA

Synonym.—*Dry rhinitis.*

Definition.—This is not a well-marked condition, although in various degrees it is not uncommonly met with. The nose may be congested, the turbinals chronically enlarged, and their smooth, glutinous surface patchy, with small, moist, dirty-black crusts, which are also scattered over the septum and middle meatus. In other cases the mucous membrane is pale and collapsed, adhering closely to the underlying turbinals, and leaving very roomy nasal chambers. Crusting is then less common.

Etiology.—The first type is met with in alcoholic, plethoric, adult males, and in factory workers of both sexes. The second, the collapsing turbinal form, is more common in anæmic females who suffer from constipation, dyspepsia, uterine disorders, want of air, or the usual causes of catarrh.

Symptoms.—Obstruction is the most common symptom in the first type of case, and irritation in the nose is common to both.

* W. Stuart-Low, *Clin. Journ.*, 1906.

Otto T. Freer, *Laryngoscope*, xxi., 1911, No. 12, p. 1136.

But often the chief symptoms are referred to the usual sequelæ of nasal disease in the pharynx and larynx (*see* Symptoms of Nasal Disease, p. 92).

Examination.—In addition to the changes described, it will be noticed that the crusts are small and never offensive, and that they do not adhere very closely, although on the septum they may produce excoriation and epistaxis, and lead to perforation.

Diagnosis.—From ozæna the affection is distinguished by the absence of fetor, or atrophy of bone, and the preservation of the sense of smell. Any perforation must be distinguished from that of syphilis (*see* p. 659).

Treatment.—In the congestive type the avoidance of dust, alcohol, and tobacco is important. The nose must be cleansed and lubricated, as directed for hypertrophic rhinitis, and attention paid to dyspepsia and constipation (p. 134). The collapsing form met with in females may require some simple cleansing and soothing treatment directed to the nose and throat (*see* Chronic and Hypertrophic Rhinitis, pp. 129 and 134), but it is not well to concentrate the attention of these patients too much on the local condition. The condition of the pelvic organs is frequently at fault, and the general health and habits of hygiene may require regulating.

ATROPHIC RHINITIS

Synonyms.—*Ozæna* (from ὄζειν, a stench); *atrophic catarrh*; *coryza fœtida*; *sclerotic rhinitis*.

Definition.—A chronic rhinitis characterized by atrophic changes in the nasal mucosa and turbinals, abnormal patency of the nasal fossæ, a muco-purulent discharge which tends to dry into crusts with a characteristic fetor, but without ulceration or necrosis.

The term ozæna was formerly applied to any foul-smelling nasal discharge, whether originating from syphilis, lupus, sinus suppuration, or other pyogenic process. It should be restricted to conditions coming within the above definition, and not applied to rhinitis sicca or turbinal collapse (p. 139).

Etiology. Predisposing causes.—Most cases begin between the ages of 7 and 12, and few originate after 25.* It is much less common in males than in females, in whom it is said to occur five times as frequently. In some cases the disease is found in several members of the same family. This might be due to (a) contagion, (b) heredity, or (c) the inheritance of predisposing anatomical characters, to be considered farther on.

* Treitel, *Arch. f. Laryngol.*, xvi., 1904, S 336.

Exciting causes.—The cause of atrophic rhinitis is unknown. Numerous hypotheses have been advanced. The chief theories are included in the following

TABLE OF POSSIBLE CAUSES

(a) *Structural*—

1. Congenital narrowness of the nasal fossæ (Berliner, Tillot, Sauvage).
2. Undue patency of the nasal chambers, from the type of skull (Hopmann, Siebenmann, Gerber, J. Wright).
3. Arrest of development of inferior turbinals (Zaufal).

(b) *Secondary, from*—

4. Purulent rhinitis of childhood (Bosworth, Lack, C. A. Parker).
5. Ethmoidal osteitis (Tissier).
6. Rarefying osteitis of inferior turbinals with secondary alterations in mucosa (Cholewa and Cordes).
7. Accessory sinus disease (Michel).
8. Focal suppuration in the nose, accessory cavities, or post-nasal space (Grünwald).
9. Atmospheric desiccation and bacterial invasion (Freudenthal).

(c) *Bacterial and infective*—

From laboratory results :

10. Cocco-bacillus (Löwenberg).
11. Bacillus mucosus (Abel).
12. Bacillus fœtidus ozænæ (Hajek).
13. Pseudo-diphtheria bacillus (Bellfanti and Della Vedova).
14. Cocco-bacillus fœtidus ozænæ (Perez).
15. Pes-Gradenigo bacillus.

From clinical observation (Massei, Perez, Lermoyez).

(d) *Constitutional*—

16. Syphilis.
17. Tuberculosis.
18. Atrophic neurosis (W. Williams, Zarniko, Réthi, Chauveau, Ferreri).
19. A toxic infection, particularly slow in progress, acting especially on the vessels and glands of the pituitary membrane, and possibly associated with tuberculosis.

The theory propounded by Bosworth regarded the ozæna as secondary to hypertrophic rhinitis, the long-continued muco-purulent discharge and the hypertrophy being succeeded by sclerotic fibrosis of both the mucous surface and turbinal structures.*

Adenoids are by far the most frequent cause of purulent rhinitis, and the observation that ozæna has become rarer since these growths have received recognition is claimed as supporting this view.

Increased roominess of the nasal chambers, with short noses and comparatively deep postnasal spaces, is met with in individuals with

* "Diseases of the Nose and Throat," vol. i., p. 162.

the brachycephalic type of skull. This type is met with in 50 per cent. of the cases of atrophic rhinitis. It is indicated externally by a wide face, broad, tip-tilted nose with open nostrils, and insignificant bridge. These wide, short fossæ would permit of the passage of an undue amount of air, and so might conduce to atrophy.

Suppuration in the accessory sinuses of the nose is certainly the true diagnosis in many cases. There are two difficulties in accepting this as the general cause. One is, that the sinuses are incompletely developed, and suppuration in them comparatively rare, at the age when atrophic rhinitis develops; the other is that even when suppuration in the sinuses is found it is not easy to determine which of the two processes was the primary affection—if they are not simply coincident. On the other hand, there is little doubt that the more frequent recognition of sinus suppuration has greatly reduced the number of cases which formerly would have been diagnosed and treated as ozæna. Anyone revisiting a large throat clinic after an absence of some years must be struck with the comparative rareness of this once fairly frequent disease. And, again, suppuration in the frontal and maxillary sinuses seldom gives rise to symptoms of ozæna; but it is not at all uncommon for pus in the sphenoidal and posterior ethmoidal cells to do so. Now, these cells are present at birth, and are close to the postnasal space, so frequently the seat of suppuration in early childhood.*

Bacteriology is unable to settle this question; first, because many of the organisms separated may be met with in other conditions, or even in apparent health; and, secondly, because of the difficulty of determining whether they are the direct exciting cause of the atrophy, or only secondary, and then the cause of the fetor. The latter is the view generally taken in regard to the Löwenberg-Abel bacillus,† which is met with in rhinitis sicca, syphilis, and other diseases. The presence of the Klebs-Löffler bacillus in ozæna was first demonstrated by Bellfanti and Della Vedova, who regarded the disease as a chronic form of nasal diphtheria.‡ Many investigators of atrophic rhinitis have separated a bacillus which both in appearance and culture resembles the Klebs-Löffler bacillus,§ but the researches of eighteen years have not confirmed the views of the Italian authors.

Hofer claims that cultures of the *Cocco-bacillus mucosus* of Beeritz have the characteristic odour of ozæna, and that not only local applications to the nasal mucous membrane of the rabbit, but also intravenous injections, resulted in a typical rhinitis with the characteristic smell.|| De Simoni has inoculated the normal nasal mucous membrane with the Löwenberg-Abel bacillus, the pseudo-diphtheria bacillus, the *Diplococcus lanceolatus* of Fraenkel, and also with crusts from cases of ozæna, and in no instance did he succeed in reproducing the disease.¶ On the other hand, Perez claims that he has discovered the specific agent in the *Cocco-bacillus foetidus ozænae*,** and that every case origin-

* Clement F. Theisen, *Laryngoscope*, xviii., 1908, No. 6, p. 417.

† B. Löwenberg, "Le Microbe de l'Ozène," *Ann. de l'Institut Pasteur*, viii., 25 Mai, 1894, No. 5.

‡ *Arch. Ital. di Otologia*, 1896, fasc. 2.

§ J. O. Symes, *Brit. Med. Journ.*, Feb. 28, 1903, p. 484.

|| *Proc. XVIIth Internat. Cong. Med.*, London, 1913.

¶ *Il Policlinico*, Anno vi., 15 Agosto, 1899, vols. vi.-c., fasc. 8.

** *Ann. de l'Institut Pasteur*, Dec., 1899.

Ann. des Mal. de l'Oreille, xxxiv., 1908, No. 5, p. 549.

ates by infection from another patient, or from the muzzle of a dog.* Massei had long ago suggested that the disease might be infectious,† and Lermoyez has lately espoused the view, pointing out that in degree it is analogous to tuberculosis rather than to zymotic disease.‡

Ozæna must be carefully differentiated from syphilitic rhinitis, whether hereditary (Fig. 287) or acquired; but many authors are agreed that a syphilitic taint has an effect on the evolution of ozæna. The coexistence of tuberculosis and ozæna can frequently be observed. The subjects of ozæna are sometimes "strumous-looking," tubercular, or anæmic. The condition described as "strumous" may act as a predisposing factor, but what is more certain is that ozæna is often followed by pulmonary tuberculosis.§

Some authors would regard ozæna as a parasymphilitic affection, but Broeckaert thinks that a paratuberculosis is a more direct etiological factor, platyrrhinia and other anatomical conditions being predisposing causes.

Pathology.||—The chief alteration is the atrophy of the mucous membrane. The ciliated epithelium becomes replaced by stratified; the glands atrophy; the capillaries and venous spaces are obliterated; the walls of the small vessels are thickened; there is round-celled infiltration around the vessels and glands, and the underlying tissue is converted into dense connective tissue. The whole process is one of diffuse sclerosis, but this does not necessarily take place uniformly, and it is not infrequent to find hypertrophy and even polypi in the region of the middle turbinal, while there is marked atrophy of the inferior turbinal. Atrophy also attacks the bony structures, but particularly that of the inferior turbinal, so that the middle turbinal appears larger by contrast.

The secretion of this surface is, of course, very different from the normal. It is much less liquid, and instead of being clear, practically sterile mucus, it is thick with cellular detritus and teeming with micro-organisms. There are no cilia to wave the secretion towards the orifice, and in the widened nasal thoroughfares the expiratory blast of air acts with diminished force. Hence the secretion stagnates in the nose, putrefies, and, losing its moisture by evaporation, dries into adherent crusts. It is important to note that there is no necrosis of bone in this process,

* *Revista de la Sociedad Médica Argentina*, xiv., p. 437.

Ann. des Mal. de l'Oreille, xxxiii., 1907, No. 6, p. 532.

Berl. klin. Woch., Dec. 29, 1913; and *Brit. Med. Journ. Epitome*, May 30, 1914.

A. Brown Kelly, *Journ. of Laryngol.*, xxix., May, 1914, p. 255.

† "Patologia e Terapia della Faringe," etc. Prima edizione, 1889, pp. 176 and 198.

‡ *Ann. des Mal. de l'Oreille*, xxxiii., 1907, No. 1, p. 1.

§ Alexander, quoted by Moeller and Rappoport, *Zeits. f. Tuberc.*, July, 1903; and *Brit. Med. Journ. Epitome*, Jan. 9, 1904.

Clement F. Theisen, *Trans. Amer. Laryngol. Assoc.*, 1904, p. 130.

|| J. S. Fraser and F. E. Reynolds, *Journ. of Laryngol.*, xxvi., No. 4, p. 169.

Jonathan Wright, *Laryngoscope*, xxiii., 1913, No. 6, p. 641; and *Trans. Amer. Laryngol. Assoc.*, xxxv., 1913, p. 12.

nor ulceration of the surface, although abrasion of the mucous membrane may occur from forcibly detaching the adherent crusts. The histology of the condition is thus summarized by Wyatt Wingrave: (1) Transformation of the columnar, ciliated, and special olfactory cells into stratified squamous epithelium; (2) disappearance of the hyaloid basement membrane; (3) the presence of special hyaloid bodies and pigment masses; (4) changes in the glands; (5) changes in the lymphoid tissue and blood-vessels; (6) changes in the bone.* There is marked absence of lymphoid tissue in the nose and naso-pharynx, and atrophy of the thyroid gland has been noted.

Symptoms.—The offensive smell from the nose is often the chief complaint. This odour is so penetrating that the affection in Germany is called "Stinknase," and in France "la punaisie." The smell, which, in women, is generally worse at the menstrual period, is sometimes, in early and less marked cases, perceptible to the sufferer, as her own olfactory sense may not be entirely destroyed. But, as a rule, she has complete anosmia, and is generally unconscious of this offensiveness, and complains of a thick or crusted discharge from the nose, of the obstruction caused by its accumulation, or of dry throat, and cough. The atrophic process may spread directly to the pharynx or larynx, causing the symptoms of atrophy in these regions, either by direct extension, or, more commonly, by the inhalation of unfiltered air or of decomposing material.

The separation of the crusts may cause slight epistaxis. The ears are sometimes affected, and ocular disturbances have been traced to the nasal condition. The stomach not infrequently suffers from the absorption of putrid material. It is not surprising that such a condition should produce general deterioration of health, mental depression in many cases being traceable to the nasal condition, not only directly, but from the patient's recognition of the fact that she is shunned by society.

Examination.—The facies of a well-marked case is sometimes suggestive, the bridge of the nose being somewhat collapsed, and the nostrils consequently more vertical and visible. The alæ narium are rounded, thickened, inactive, and very deficient in vibrissæ. The inside of the nose is found to be more or less blocked with yellow, green or black crusts. These can be removed, or carefully wiped away, after a preliminary softening. A more fluid muco-purulent secretion may then come into view, generally more evident in the middle meatus. The atrophic condition described is now visible, and through the roomy nasal chambers it is easy

* *Journ. of Laryngol.*, viii., Feb., 1894, p. 96.

to see the posterior wall of the naso-pharynx, the anterior wall of the sphenoidal sinus, the upper surface¹ of the soft palate, the salpingo-pharyngeal walls, and often the mouths of the Eustachian tubes. If the patient is requested to swallow a little saliva or water while these parts are being inspected, their position and relationship will be more easily recognized (Fig. 16, p. 22).

The mucous membrane of the pharynx and postnasal space will often be coated with crusts, and the mucous membrane will be found chronically congested, but shiny from the absence of mucous glands, and puckered from atrophy. Crusts and atrophy may be visible in the larynx and trachea. Primary tracheal ozæna is rare.*

Diagnosis.—In early life the condition is with difficulty distinguished from hereditary syphilis. In later years it has to be diagnosed, not only from syphilis, but from a foreign body, rhinolith, empyema, lupus, or suppurating adenoids. If the affection is one-sided it should always give rise to the suspicion of a foreign body or of hereditary syphilis in childhood, and in adult life of a rhinolith, syphilis, or a latent empyema. While these affections may, of course, be bilateral, it is very rare for atrophic rhinitis to be limited to one side. The smell given out by tertiary syphilitic affections of the nose is due to the breaking down of a gumma or to necrosis of bone, but, while very offensive, it is of a different character and hardly so persistent and nauseating as that of atrophic rhinitis. Probably empyema gives rise to more errors in diagnosis than any of the other conditions mentioned. The directions for the location of local suppuration should therefore be carefully followed, and the patient should only be condemned to a diagnosis of true ozæna when the possibility of an empyema has been carefully excluded (p. 250).

Prognosis.—This affection is the opprobrium of rhinology, and it would be rash to promise a cure in any well-marked case. At the same time, the patient can generally be comforted with the assurance that treatment will remove the offensiveness of the complaint and render her tolerable to her fellows; but the treatment must be kept up indefinitely. “*Tant durera le traitement, tant durera la guérison*” (Lermoyez). It is generally taught that the affection tends to disappear after middle life. It is certainly more rarely met with, though not unknown, in adults; this may be due to their withdrawing themselves from treatment, or to other causes.

Treatment.—The nose must be cleansed often enough to prevent the formation of crusts. The liquid secreted by the nose has

* G. Labyle, Thèse de Paris, 1906-7.

a faint, sickly smell, and it is only when it stagnates and dries in the nose, and provides a nidus for the organisms of putrefaction, that it becomes so pestilential. This cleansing can be carried out in any of the ways mentioned at p. 56; but as the condition under consideration requires a forcible method, and one that can be used expeditiously, the 3-ounce pear-shaped syringe (Fig. 80), Weber's nasal douche, or a Higginson syringe, used with the necessary precautions, will be found most useful (*see* Cleansing the Nose, p. 56). The lotion should consist of one or two pints of warm boiled water, to which has been added a teaspoonful of ordinary



Fig. 80.—3-oz. syringe for irrigating the nose.

table salt, bicarbonate of soda, or one of the powders mentioned on pp. 801 and 802. The exact composition of the lotion is not of so much importance, as it chiefly acts mechanically; the important points are that it should be abundant, alkaline, isotonic with the blood, and warm. It may be rendered more pleasant by the addition of thymol (1-10,000), resorcin (1-200), phenosalyl (1-1,000), sanitas fluid (1-50), formolyptol, or other unirritating compound antiseptic. If the crusts are very adherent it may be advisable to detach them by a preliminary softening in order to avoid any bleeding. This is best done by the use of peroxide of hydrogen (p. 84), or by wearing what are called Gottstein's cotton-wool plugs in the nose. These are simple pledgets of cotton, sufficiently large to obstruct half the lumen of the nostril. By diminishing the amount of air passing into the nose, partly filtering it, and causing reduced pressure in the nasal chambers, a freer

secretion is encouraged and the crusts tend to loosen more easily. These plugs can be used at night. When the nose has been cleansed it should be well lubricated with an oily spray (Formulæ 66 to 69).

This cleansing process can, of course, be more thoroughly carried out under the eye of the practitioner, who, with a Higginson syringe and a silver Eustachian catheter as a nozzle, directs the lotion through the nasal speculum on to any desired part. Sometimes it is desirable for the medical attendant to demonstrate in this way how thoroughly the nose can be purified, and, when possible,

a short course of cleansing, painting, and packing should be given two or three times a year.

After being cleansed the nose can be packed with a strip of ribbon gauze medicated with iodoform, sanitas, boric acid, chinisol, eurenphen, or double cyanide of mercury wrung out of sterilized water. The discomfort of mouth-breathing thus entailed is soon tolerated, and the patient learns to carry out the treatment satisfactorily. When the plug is changed, the secretion is found to be fluid and free from fetor. If the gauze adheres, its introduction can be preceded by an oily spray, or it may be moistened with oil or peroxide.

Some patients prefer cotton-wool moistened with olive oil. The plug is changed every eight or twelve hours; the patient may only be able to tolerate it by day, or may prefer to wear it at night. After a three to six months' use it can be discontinued, to be resumed occasionally for a short course, particularly after any relapse. The copious cleansings are at first carried out three times a day or oftener, and gradually discontinued as the crusting diminishes, but some morning and evening cleansing should never be omitted.

Before being packed, a solution of glycerin and iodine or ichthyol (Formulæ 71 and 78) may be painted over the cleansed surface. Vibratory massage can be applied to the wasted turbinals. This can be done with cotton-tipped probes dipped in Mandl's solution or balsam of Peru. These methods stimulate the glands and the atrophied turbinals. Applications of "scarlet red," once or twice a week, have been recommended.* A 5 per cent. ointment is spread over the nasal surface after it has been thoroughly cleansed.† Occasionally, under cocaine, the surgeon may spray or paint the nose with a 1 per cent. solution of formalin. This is very painful and should be preceded by cocaine.‡

Complications must be treated as they arise. If suppuration in the sphenoidal or posterior ethmoidal cells is associated, relief, but not necessarily cure, of the nasal process may be hoped for.

Submucous injection of paraffin, first proposed by Lake§ and Brindel|| is said to give satisfactory results.¶ It produces an artificial stenosis in the too roomy nostrils, so that crusts are easily blown out,

* K. K. Wheelock, *Laryngoscope*, xxiii., 1913, No. 10, p. 986.

† W. C. Wood, *ibid.*, xxiv., 1914, No. 5, p. 503.

‡ Bronner, *Proc. Laryngol. Soc., London*, xii., Nov., 1904, p. 14.

§ *Ibid.*, March, 1902.

|| *Rev. Hebd. de Laryngol.*, xxi., i., 1902, No. 23, p. 721.

¶ Moure and Brindel, *Rev. Hebd. de Laryngol.*, xxiv., ii., 1903, No. 41, p. 417.

Broeckaert, *Soc. Franç. d'Oto-laryngologie*, Mai, 1906.

Broeckaert, *Presse Oto-laryngologique Belge*, Nos. 5-6, 1906.

R. Botey, *Ann. des Mal. de l'Oreille*, xxxv., ii., Nov., 1909, p. 564.

instead of stagnating till they decompose and irritate the mucosa. Besides, the injected masses of paraffin produce, by reaction, increased vascularity, and hasten the sclerosis in which the disease eventually terminates, but without the usual collapse of the turbinals. This treatment is not suitable in cases where the turbinals are markedly atrophic, and is seldom indicated in patients over 40. It may be combined with local cleansings or surgical treatment. In early cases it may result in a practical cure, i.e. all local washings can be discontinued, secretions can easily be blown out, and the fetor ceases. Treatment must be carried out gradually, and persevered with. Paraffin may have to be injected along the septum and floor of the nose, as well as into the inferior turbinal. Injections may be made under cocaine. The first ones should be introduced as far back as possible. Further directions are given at p. 668.

If a paraffin fusible at 45° C. is employed, Broeckaert states that the injections are free from danger. Fliess uses a paraffin with a melting-point of from 50° to 52° C., as he states that severe and even fatal cases of embolism of the lung, or of the central artery of the retina, have been recorded with the softer forms.* But Burger and others have found the method useless, and, as it is not free from discomfort and danger, it cannot be generally advised at present.†

General treatment.—Needless to say that the general health and hygiene of the patient requires attention. Good air and diet, and the avoidance of dust, alcohol, and tobacco, are important. Many patients who are anæmic are benefited by the syrup of iodide of iron or other ferruginous preparation. Even when syphilis is not suspected, a short course of iodide is sometimes called for to promote secretion and loosen the crusts. The seaside has long had a reputation in this complaint.

Other methods of treatment may be briefly referred to. The insufflation of antiseptic powders is best avoided. Their odour only masks that of the crusts, and favours the stagnation and desiccation of the secretion. Powders of citric acid, 25-35 per cent., with sugar or milk, have been recommended.‡ Caustics, such as nitrate of silver, and strong caustic or antiseptic solutions, are useless. Curetting should be most carefully avoided on the inferior turbinal. It may be beneficially directed to the ethmoidal labyrinth, if pus should be located there. The middle turbinal and any polypi should be respected, unless obviously causing symptoms. It is sometimes suggested that when the disease is limited to one side, and the other nasal chamber is narrowed by a deviated septum, the latter should be rectified. The only suitable operation would be a submucous resection; but unilateral ozæna is a rare affection, and is always suggestive of sinus suppuration.

Electrolysis, at one time greatly praised by Brindel, Réthi, McBride, and C. M. Cobb,§ and the local use of the constant or interrupted elec-

* *Berlin. klin. Woch.*, March 7, 1904.

† Burger, *Rev. Hebd. de Laryngol.*, 1905, i., No. 6, p. 158.

‡ Lewis S. Somers, *Therap. Gazette*, March, 1900.

§ *Journ. Amer. Med. Assoc.*, March 16, 1901.

trical current, are now seldom employed, and the galvano-cautery should be banned. We must carefully avoid doing anything which destroys any small amount of ciliated epithelium or glandular tissue still remaining.

The injections of the serum of diphtheria antitoxin were much praised some years ago. They appear to produce a temporary amelioration, but the treatment is not curative. A polyvalent vaccine made from the *Cocco-bacillus fœtidus ozænæ* has not given very encouraging results.*

Prophylaxis.—Until the true etiology of atrophic rhinitis is determined, we can give no positive advice as to prevention. Purulent rhinitis, at all ages, should receive more attention than it has hitherto commanded (p. 127), and its frequent dependence on inflamed adenoids or sinusitis must be kept in mind. The early recognition of congenital syphilis is important. The sooner ozæna is diagnosed, so that suitable treatment can be instituted and harmful measures avoided, the earlier will atrophy be arrested, and the simpler will be the measures required to keep it in check.

FIBRINOUS RHINITIS

Synonyms.—*Rhinitis fibrinosa*; *croupous rhinitis*; *membranous rhinitis*.

Definition.—An inflammatory affection of the nose characterized by a membranous exudation, generally associated with the Klebs-Löffler bacillus, but sometimes with other organisms, as the pneumococcus, *Streptococcus pyogenes*, and *Staphylococcus pyogenes aureus*.

Etiology.—Fibrinous rhinitis is most commonly met with in the children of the poor, under the age of 8; it seldom occurs after 16. It appears to be more frequent in the autumn months, and occasionally follows measles, scarlatina, or influenza. No immunity is conferred by one attack; on the contrary, there is some tendency to recurrence.

Pathology.—The membrane is found on the inferior turbinal, the floor, and occasionally the septum. It is greyish-white, slightly adherent, and, when removed, leaves a raw red surface with a little tendency to bleed. With it there is a watery, non-fetid, irritating discharge, which may excoriate the nasal orifice. The disease may be unilateral, but both nostrils are generally involved. Occasionally a patch of membrane is found in the pharynx, usually on one side, and it may be met with in the postnasal space.

Bacteriology.—In the majority of cases the Klebs-Löffler bacillus is present. According to Lack, it may occur in pure culture and of full virulence.†

* G. Hofer and K. Kofler, *Wien. klin. Woch.*, Oct. 16, 1913; and *Brit. Med. Journ. Epitome*, Jan. 24, 1914, p. 16.

† *Med.-Chir. Trans.*, lxxxii., 1899.

Symptoms.—These may be so slight as to be neglected, and in no case are they severe. The usual ones are obstruction and catarrh. The discharge at first is profuse and watery; later on it becomes thick, yellow, and blood-stained. Occasionally there is epistaxis; there is never fetor. In some cases the discharge is trifling, the only complaint being of obstruction. The glands in the neck may be slightly enlarged. The temperature may be raised to 100°. Beyond a little malaise in the early stage, the general symptoms are so slight that the child is never kept in bed, and advice is seldom sought except for the local discomfort.

Examination, in addition to the membrane described, will show the nasal chambers occupied with thick mucus and crusts.

Duration.—The membrane may disappear, and the nose return to normal, within a week; but while its average duration is about five weeks, the disease may persist for three months.

Prognosis is always good. No fatality has been recorded; spontaneous recovery is the rule. The affection has never been followed by paralysis, and the only possible sequelæ are adhesions between the septum and inferior turbinal (p. 91).

Diagnosis.—Although associated with the Klebs-Löffler bacillus, fibrinous rhinitis is, clinically, very different from diphtheria in the nose (cf. p. 722). The latter is an acute infection, with grave local and general symptoms, often accompanied by profuse epistaxis, apt to be followed by paralysis, and frequently fatal. Fibrinous rhinitis, on the other hand, is an ambulatory affection, with no constitutional symptoms, and is almost a local disorder. Locally, also, it differs from true nasal diphtheria in producing a more superficial necrosis.

So much is fibrinous rhinitis a local affection that the symptoms might be mistaken for those of a foreign body, particularly if one-sided. There being no urgency as regards the removal of the latter, a culture of the nasal secretion should be made before exploring for a foreign body, as this latter step in young children often requires a general anæsthetic (p. 180). When the membrane is semi-detached it may be mistaken for a collapsed polypus.*

Treatment.—Spontaneous recovery being the rule, it is sufficient to give relief by cleansing and lubricating the nose. The blandest lotion should be used (Formula 8), followed by a parolein spray. In small children a few drops of oil may be dropped into the nostrils, or some ointment may be sniffed up (p. 61).

It is useless to remove the membrane forcibly, and the local

* C. J. Symonds, *Lancet*, Sept. 16, 1899, p. 785.

employment of strong antiseptics can only be harmful. The injection of diphtheritic antitoxin does no good.

Infection, notification, and isolation.—The investigations of Lack failed to show that fibrinous rhinitis could be traced to infection from cases of diphtheria, or that it ever caused diphtheria in others. But as several cases of fibrinous rhinitis sometimes occurred in one family it would seem to be infectious, giving rise to similar clinical symptoms, just as diphtheria reproduces diphtheria. Other observers, however, have recorded instances in which severe cases of diphtheria have resulted from contact with a case of membranous rhinitis.*

The widespread distribution of the Klebs-Löffler bacillus has been referred to when considering ozæna (p. 142). In the present state of our knowledge, therefore, action cannot be based simply on the presence of this organism. In fibrinous rhinitis, as in ozæna, there does not appear to be any necessity for notification or strict isolation. Still, as the disease may reproduce itself, a child should be kept away from school, and from immediate contact with his fellows, and cultures or animal inoculations should be made before this quarantine is relaxed.

Postscarlatinal rhinitis.—Children in hospital during their convalescence from scarlatina are peculiarly liable to a rhinitis affecting the vestibules and adjoining upper lip, with a weeping, raw, granulating and scabbing catarrh. Although no exposure to infection from diphtheria can be traced, this secretion may show the presence of the Klebs-Löffler bacillus, virulent for guinea-pigs. There is no formation of membrane in this scarlatinal rhinorrhœa, but otherwise there is much similarity between the two affections in regard to age, duration, absence of temperature, and paralysis.†

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RHINITIS CASEOSA

Synonyms.—*Caseous rhinitis*; *coryza caseosa*; *nasal cholesteatoma*.

Definition.—A rare disease, first described by Duplay,‡ and characterized by an accumulation in the nose of a cheesy material with a horribly fetid odour.

* Duncan Forbes and H. P. Newsholme, *Lancet*, Feb. 3, 1912, p. 292.

† C. Todd, *ibid.*, May 28, 1898.

‡ "Traité de Pathol. Externe," vol. iii., 1874.

Etiology.—Caseous rhinitis may occur at any age from 7 upwards,* and in both sexes. The most marked cases are generally in males, but this is possibly due only to their greater disregard of offensive symptoms.

The condition is generally regarded as symptomatic and not as a pathological entity. That is, it is not due to any alteration in the secretion of the pituitary membrane, but is the result of secondary putrefactive changes in pus which stagnates in the nasal chamber. The pus may have been produced by sinus suppuration, polypi, a foreign body,† tumours, or nasal stenosis. Other observers, while agreeing that this is the cause of some cases which they prefer to regard as pseudo-rhinitis caseosa, claim that this mechanical theory will not meet all cases, and that there is in addition a form of true rhinitis caseosa, which most of them ascribe to the *Streptothrix alba*.‡

Symptoms.—The patient chiefly complains of the gradual onset of nasal obstruction and fetid discharge. The offensive odour, unlike that occurring in ozæna or in sinus suppuration, is perceptible both to himself and his friends. In addition there may be headache, and the usual sequelæ of nasal disease (p. 92). If the disease is marked there may be broadening of the nose and disfigurement, anosmia, and defective taste.

Pathological changes.—Examination will show, in one side of the nose, a yellow or putty-like cheesy material. This may be so large in amount as to fill a 3-ounce glass measure. The mass may push over and perforate the septum, destroy the inferior turbinal, eat away the antro-nasal wall, and invade the antrum.§ It may even ulcerate through the hard palate into the mouth (Masini). A foreign body, rhinolith, or piece of necrosed bone may be found in the midst of the cheesy mass, and polypi or sinus suppuration may be present. As a rule there is no ulceration. Examination of the caseous material shows that it has the consistence of bird-lime, and is principally composed of fatty matter, stearin,

* W. H. Kelson, *Brit. Med. Journ.*, Dec. 31, 1904.

† E. Law, *Proc. Laryngol. Soc.*, London, vol. iv., March, 1897.
J. Dundas Grant, *ibid.*

‡ Guarnaccia, *Arch. Ital. di Laringol.*, 1896, Anno xvi., fasc. 4.

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J. Bark, *Journ. of Laryngol.*, xviii., 1903, No. 12, p. 619.

Dardel, *Rev. Heb. de Laryngol.*, xxvii., 1906, No. 2, p. 32.

Mignacca, *La Pratica Oto-rino-laringoiatrica*, Anno vii., Aprile, 1907, No. 2, Milano.

J. Dundas Grant, *Proc. Roy. Soc. Med.*, Laryngol. Sec., April, 1909, p. 125.

§ W. H. Kelson, *loc. cit.*

W. Hill, *Proc. Laryngol. Soc.*, London, iv., March, 1897, p. 72.

cholesterin crystals, and large numbers of the ordinary organisms of putrefaction.* Some observers deny the presence of fat or epithelial cells, and so regard the title of "cholesteatoma" as misleading. According to Arthur Edmunds, there is no fat or epithelial remnants, but the material is made up of cholesterin in small quantities and crystals of calcium phosphate imbedded in a mass of granular detritus. He compares the condition to chronic catarrh of the gall-bladder, accompanied by the formation of calculi composed of calcium combinations.†

Prognosis.—Once the cheesy material is completely cleared away, the nasal cavity is quickly restored to a healthy condition. Prognosis should be reserved until the collection has been removed, lest it conceal polypi, sinus suppuration, or other conditions.

Diagnosis.—This is based on the odour, the one-sidedness, the history, and the recognition by the probe of a cheesy material. The fetid discharge, the distension of the nose, and the perforation of the bony walls by a fungating mass are apt to simulate the symptoms of a malignant growth.‡

Treatment.—In mild cases, with the assistance of some applications of cocaine and adrenalin, and the use of warm alkaline nose lotions (Formulæ 8 to 11), the patient may succeed in expelling a small cheesy collection. In some instances the expulsion is assisted by breaking down the mass with a bent probe or small spoon or curette. With larger masses a general anæsthetic must be given, and it may be necessary to introduce the left forefinger into the postnasal space to prevent the mass from slipping backwards, and to steady it while it is broken up. The operator should be prepared to deal with a rhinolith (p. 182).

After-treatment consists of ordinary cleansing measures.

* P. Abercrombie, *Journ. of Laryngol.*, xix., 1904, May, p. 272.

† *Brit. Med. Journ.*, Jan. 28, 1905, p. 480.

‡ Moure, *Soc. Franç. de Laryngol.*, 14 Mai, 1907.

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Most of the cases recorded have been published in Italy. Nearly all the references are in the papers quoted by Dardel and Mignacca.

CHAPTER IX

DISEASES OF THE SEPTUM

TRAUMATIC ULCERATION AND PERFORATION OF THE SEPTUM

Definition.—An ulceration due to local injury, limited to the cartilaginous septum, and generally going on to perforation, whereupon the process ceases.

Etiology and pathology.—At one time it was thought that most ulcerations of the septum, and nearly all perforations, were due to syphilis. This is now known to be a mistake. It is true that nearly all perforating ulcerations of the bony septum are due to syphilis, but when the cartilaginous septum only is attacked, the presumption is in favour of its not being due to a specific process.

This traumatic ulcer is conducted to by rhinitis sicca and deformities of the septum, particularly in patients subject to epistaxis (p. 110). In any case the exciting cause is the deposition of discharge or dust over the bleeding area of the septum (Fig. 64, p. 112). Even in healthy conditions a slight deposit of dust may occur about the centre of the cartilaginous septum, where it is directed by the current of air bounding off the external wall of the vestibule.* It is to this spot that the fine powder of chromic-acid workers is directed, and they are particularly apt to suffer from the condition under consideration. The manufacture of copper-arsenic green is said to produce perforation in 61 per cent. of the workmen.† The deposit of dust excites irritation which the patient, sometimes quite subconsciously, is apt to relieve by picking his nose or violently rubbing the external ala against the septum. In this way an abrasion is started which further attracts the deposit of dust, and forms a little scab. Attempts to remove this will start a shallow bleeding ulcer, which increases in surface and depth with each successive dislodgment of scab. If the process is not arrested it spreads down until the

* Charles W. Richardson, *Trans. Amer. Laryngol. Assoc.*, 28th Congress, 1906, p. 223.

† J. M. Brown, *Laryngoscope*, xii., 1902, p. 724.

cartilage is exposed. As this is deprived of its blood supply it tends to slough, and, finally, it necroses, and the deepest part of the ulcer opens into the opposite nostril. The small opening in the secondarily affected nostril always enlarges until it corresponds with the large area of the original ulcer. The margin of the perforation, if unirritated, then heals over, and leaves a circular opening in the cartilaginous septum, varying in size from the diameter of a pea to that of a threepenny-piece (5 to 10 mm.). The perforation caused by an unwise application of the galvano-cautery to the septum is produced by an exactly similar pathological process, although somewhat more rapidly.

Symptoms.—An ulcer of the septum may form, and a perforation take place, without the patient having the slightest suspicion of it. One or other is not infrequently discovered by accident. But the symptoms usually complained of are a sense of dryness and irritation in the nose, the separation of crusts, and occasional and possibly very free epistaxis (p. 110). Pain is seldom mentioned. When perforation first occurs there is often a whistling sound, caused by the passage of air through the small opening. This gives much annoyance to some patients, but they can be reassured, as it generally ceases when the opening increases to the larger, permanent condition. The perforation causes no external deformity, and falling-in of the end of the nose need not be feared.

Examination.—In the early stage the deposit of dust and, possibly, dried blood will be found on the spot indicated. On gently cleansing this away with a little cocaine solution a shallow, saucer-like, indolent ulcer will be found. It has no reaction, and its margins are bevelled, so that it is apt to be overlooked unless the loss of polish on its surface is noted. As it deepens it may bleed, and the probe will show the shallowness of its base and will prepare for a prognosis of perforation. When this takes place, the nostril secondarily invaded will be found to present a much smaller opening than the opposite one, but the practitioner must be prepared to see this gradually become enlarged. If the case does not present itself until these processes have all taken place, the perforation will present the characters already described. If, unconscious of his condition, the patient continues to irritate and pick the margins of this perforation, further ulceration will be induced, and the opening increased considerably, with occasional attacks of bleeding.

Diagnosis.—From syphilis the disease is readily distinguished by its being limited to the cartilaginous septum and by the absence of thickening, ulceration, necrosis, fetor, and pain. External deformity may accompany the syphilitic perforation. From

the perforation caused by the galvano-cautery or other caustics it can only with difficulty be distinguished, except by the history of the case.

Hæmatoma and abscess of the septum may be followed by perforation of the cartilaginous septum. The opening is then larger and irregular, otherwise the pathological changes and results are the same.

Prognosis.—In the early stages the process can be arrested by treatment. Once the cartilage is exposed, perforation is almost inevitable. The perforation itself is of no seriousness, and seldom gives much annoyance beyond a certain tendency for mucus and dust to lodge on its margins.

Treatment.—The condition of matters must be explained to the patient, who is enjoined to abstain from picking the nose, and from clearing it with his finger, even though covered with a pocket-handkerchief. Violent blowing or external rubbing of the ala should be avoided. The deposit on the septum is softened morning and evening by the use of a warm alkaline lotion (Formula 8) until the crust can be shot out *à la paysanne*, or can be gently blown or wiped away. To the abraded surface a mild mercurial ointment is then applied (Formula 75). Healing, which is very slow, may be promoted by careful, infrequent applications of weak nitrate of silver, argyrol, chromic acid (gr. v or x to ʒi), or sulphate of copper. The epithelium, once destroyed, is not renewed. Hence a white, dry, scarred surface will remain permanently on the septum. Dust and secretion are apt to adhere to this, and the patient should be warned against starting the trouble again. He will be better able to avoid this by the occasional use of a cleansing lotion, and the application every evening of some emollient.

When perforation seems inevitable, Hajek recommends that the ulcerated surface be excised, thus ensuring a smaller perforation and a cleaner margin. Most patients are loth to submit to this, and it is doubtful if the surgery of nature is not equally satisfactory in this instance. When the perforation has formed, the margins should be kept very clean, and occasionally painted with chromic acid (gr. x to ʒi) or other astringent, until they are smoothly cicatrized over. If healing is retarded by the projection of the bare cartilage beyond its covering membrane, the mucosa should be reflected for a short distance on each side, and the bare piece of cartilage removed, so that when the reflected flaps are allowed to come together they cover over the perforation in the cartilage with a smooth, slippery, mucous surface (Fig. 81).*

* M. A. Goldstein, *Laryngoscope*, xvi., 1906, p. 879.

The patient may find it a comfort to continue cleansing the margins of the perforation morning and evening in the manner described. He should avoid dust and other causes of irritation.

HÆMATOMA OF THE SEPTUM

Etiology.—A blood tumour of the septum is generally due to blows or falls on the nose, and is, consequently, more common in

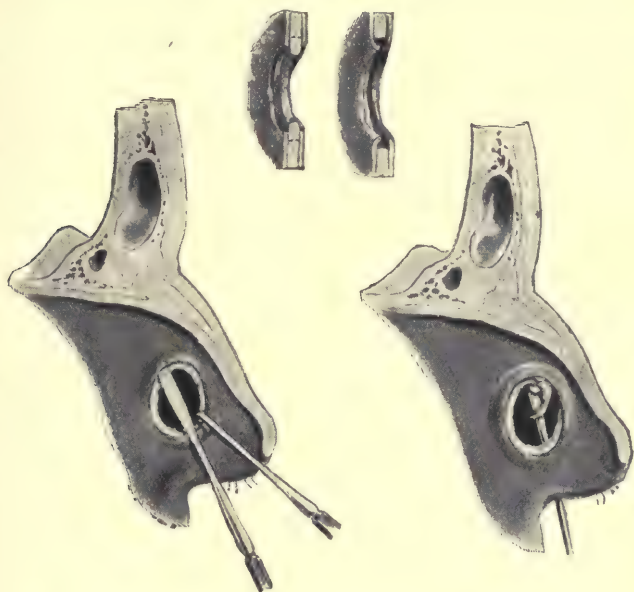


Fig. 81.—Operation for perforation of the septum.

The muco-perichondrium is reflected for some distance round the opening so as to allow of the projecting rim of cartilage being removed. The exposed edge is then covered over by the two mucous surfaces falling together. (*M. A. Goldstein.*)

children and in boys. It may also occur after the operation of submucous resection of the septum (p. 170).

Pathological changes.—The cartilaginous septum, instead of being flat, pink, and firm, is occupied by a swelling on each side, like a watch-glass. This is deep-red, rounded, smooth, with an elastic feeling to the probe and finger. The effused blood may be absorbed or organized, in which case the swelling becomes firmer as it diminishes. In other cases it suppurates, and the swelling becomes softer and fluctuates (*see* p. 158). Although a little

more prominent on one side than on the other, the swelling is generally bilateral. This suggests that in all these cases there is an accompanying fracture of the cartilage.

Symptoms are those of obstruction, with some pain and stiffness.

Diagnosis is based on the recent history and on examination.

Prognosis should be guarded at first, as some days may elapse before we can be certain that the effused blood will not suppurate, and be followed by deformity.

Treatment.—If the hæmatoma is small, and not in a suppurating nose, evaporating lotions are applied externally and the swelling is left alone, but carefully inspected every day for early symptoms of suppuration. The daily application of a swab soaked in equal parts of 10 per cent. cocaine and adrenalin, or the more frequent use of a spray of the same drugs in weaker solution, may hasten absorption. If the swelling is large and tense, it is safer to incise it freely, as described on the next page.

ABSCESS OF THE SEPTUM

Etiology.—If there is any defect in the mucosa covering a hæmatoma, it may become infected and suppurate. This is a common cause of abscess of the septum. An abscess may also arise by septic wounding of the septum; this may occur in operations on the accessory sinuses. Some cases of idiopathic origin are on record,* and the condition is said to arise spontaneously in enteric, smallpox, typhus, measles, glanders, anthrax, erysipelas, influenza, syphilis, tubercle, and by the extension of suppuration from the upper incisors.

Pathological changes.—A swelling takes place of the same shape, and in the same situation, as a hæmatoma. It is not so acutely deep-red in colour, but is more dull-purplish, and sodden-looking. There is fluctuation, not only over each watch-glass swelling, but from one side of the septum to the other. As this symptom is accompanied by marked tenderness on pressure over the end of the nose externally, it indicates that inflammation and partial destruction of the quadrilateral cartilage have taken place. The abscess may rupture, and pus and blood are then found in one nostril. Or this opening may be so small that a condition of chronic abscess may originate.

Symptoms.—The patient complains of nasal obstruction, with throbbing, heat, and tenderness. The nose may become quite

* Clinton Wagner, *Arch. f. Laryngol.*, vol. i., No. 1.
Bryson Delavan, *ibid.*, April, 1883, vol. iv., No. 2.

occluded, and the bulging mucosa may be present at the orifice of the nostril. Efforts to clear the nose are painful and ineffectual. (Fig. 82.)

Diagnosis.—An abscess is distinguished from a gumma by the history, the youth of the patient, the symmetry of the bilateral swellings, and their position over the cartilage of the septum. A gumma occurs in older subjects, is unilateral, less painful, does not fluctuate, and the surface is uneven and depressed instead of bulging. It is usually deeper or farther back, over the bony part of the septum.

Prognosis should be guarded. Prompt opening in an early case generally results in a *restitutio ad integrum* of the septum. But if much damage has taken place before the pus is evacuated, an abscess is only too frequently followed by an ugly disfigurement owing to falling-in of that part of the bridge represented by the cartilaginous septum. The tip of the nose then tends to tilt upwards, becoming rounded and expressionless. Or there may be both necrosis of the cartilage and sloughing of the mucous membrane, when a permanent perforation in the septum is added to the above disfigurement. This collapse may not take place until after the abscess has been opened.

Treatment.—As soon as the condition is diagnosed, a free incision is made into it under cocaine or nitrous-oxide anæsthesia. A horizontal cut is made from behind forwards right across the swelling, and as low in it as possible, to prevent the pocketing of pus. It is generally sufficient to make it on one side, as the pus from the other side can be pressed across through the defect in the cartilage. Any loose fragments of cartilage should be probed for and removed. The lips of the incision are kept apart by loosely tucking in a small piece of ribbon gauze; this promotes drainage of the lower part, and is changed daily. Afterwards healing takes place under simple cleansing measures* (p. 56).



Fig. 82.—Abscess of the nasal septum.

* Newcomb, *Laryngoscope*, xviii., March, 1908, p. 210.

DEFORMITIES OF THE SEPTUM: DEVIATIONS, SPURS, AND RIDGES

It is far more common amongst civilized peoples to find some deformity of the septum than to meet with one which is absolutely straight in the middle line. But it is only in a very limited number of instances that these deformities require to be corrected.

Etiology.—The predisposing and exciting causes may be grouped and considered in the following order:—

Predisposing causes:—

1. Diathesis.
2. Racial characters.
3. Age.
4. Sex.
5. Heredity.

Intranasal exciting causes:—

1. Defective septal development.
2. Affections of the septum.
3. Affections of other regions in the nose (high-arched palate, adenoids).
4. Excessive development of the turbinals.

Extranasal exciting causes:—

5. Traumatism.

Predisposing causes. 1. *Diathesis.*—Septal deformities are said to be exceedingly common among people suffering from the strumous, syphilitic, tubercular or rachitic diatheses.* Loewy† and Loewenberg‡ emphasize the influence of rickets, and Harrison Allen calls attention to the influence of cretinism.§ These constitutional influences are seldom apparent in the cases which mostly require relief.

2. *Racial characters.*—All writers are agreed that septal deformities are vastly more frequent among civilized than among savage races. The examination of 2,152 skulls by Morell Mackenzie in the Museum of the Royal College of Surgeons showed deformity of the bony septum in 1,657, or about 75 per cent.|| Zuckerkandl, in 263 European skulls, found about the same proportion.¶ In other races this proportion is reversed, i.e. the septum is more frequently vertical than deviated. In 92 non-European skulls, Spiess found 68 symmetrical and only 24 unsymmetrical septa.** Among the Mongols, Africans, and Poly-nesi-ans deviations of the septum are only found in about 20 per cent. (J. O. Roe).

* John O. Roe, *Trans. Amer. Laryngol. Assoc.*, 18th Congress, 1896, p. 203; and *New York Med. Journ.*, Oct. 10, 1896.

† *Berl. klin. Woch.*, 1886, No. 47.

‡ *Zeitschr. f. Ohrenheilk.*, xiii., 1883, S. 11.

§ *New York Med. Journ.*, lxi., 1895, p. 139.

|| "Diseases of the Throat and Nose," vol. ii., p. 433. 1884.

¶ "Anatomie Normale et Pathologique des Fosses Nasales." Paris, 1895.

** *Arch. f. Laryngol.*, vol. i., 1894.

The examination of 400 skulls in Paris showed that the facial angle is more and more inflected in an ascending series as we proceed from the anthropoid ape to the European, and that, progressively with this, the septum is more prone to deviation.*

This increased frequency of deformities of the septum amongst Caucasians is ascribed to two causes: first, the increase in the cranial development and the enlargement of the facial angle; and, second, the admixture of different races. The rarity of deflections among the less civilized nations has been attributed to the purity of these races, in whom the faces are as similar in their regularity as their septa. But this argument of the purity of race does not apply to the Hebrew race, which, although of pure strain, is very apt to suffer from deformities of the septum. Delavan points out that the aquiline nose, as illustrated in the Slav, the Hebrew, and the ancient Roman, is particularly apt to be associated with deflections.† A noteworthy exception to this is the North American Indian, who has an aquiline nose but rarely has a septal deflection. This is traced to the fact that he belongs to a primitive and pure race and lives an outdoor life, while the Indian mothers encourage nasal breathing from early childhood.‡

3. *Age*.—Deformities of the septum are rare, and seldom very marked, in children before the second dentition. Their frequency increases soon after that period. Kafemann examined school children under 15, and in 1,100 boys there were marked deviations of the cartilaginous septum in 84 (54 to the left, 30 to the right); in 1,102 girls there were 50 deformities (39 to the left, 11 to the right). Deviations of both cartilaginous and bony septum he found in 161 boys (84 right, 77 left) and in 128 girls (58 right, 70 left).§ Similar results were obtained by Frankenberger, who found that the proportion of deviations of the septum in school children at the age of 6 was 9 per cent., at the age of 17 it was 17½ per cent., and afterwards increased by 1 per cent. for each year of age. Spurs are much rarer than deviations at the age of 6 or 7.||

4. *Sex*.—These figures, borne out by universal experience, show that septal deformities are much more frequent in males than in females. This is generally ascribed to the greater exposure of the former to injury.

5. *Heredity*.—This does not appear to play an important part in the transmission of a tendency to septal deformity, but it certainly operates in transmitting a family likeness as regards a narrow nose, in which the effects of a deviation are more likely to be manifested than in a normally roomy one.

Intranasal exciting causes. 1. *Defective septal development*.—

At an early period of development the vomer consists of two separate laminae enclosing between them a plate of cartilage, which is prolonged forwards to form the cartilaginous portion of the septum. Ossification starts in these two plates about the sixth or eighth week of fetal life,

* Potiquet, "Médecine Moderne," tome iii., p. 153. Paris, 1892.

† *Amer. Laryngol. Assoc.*, ix., 1888, p. 202.

‡ G. Catlin, "Shut your Mouth and Save your Life." London, 1891.

§ "Schuluntersuchungen des kindl. Nasen- u. Rachenraumes an 2,238 Kindern." Danzig, 1890.

|| "Die oberen Luftwege bei Schulkindern," *Monats. f. Ohrenheilk.*, 1902, S. 163.

but is not complete until after puberty. About the third year the two plates begin to coalesce from behind forwards. It will therefore be understood that any hypernutrition of one lamina, or any lack of development, will produce a distortion of the vomer which will naturally be accentuated in the cartilage. The fact that ossification begins in the posterior end of the septum, and that coalescence takes place from behind forwards, would explain why deviations of the posterior end of the septum are almost unknown.

2. *Diseases of the septum.*—Hypernutrition from any cause may lead to a vertical or horizontal overgrowth. In this way spurs and ridges may occur, chiefly along (1) the junction of the vomer and superior maxilla, (2) the anterior border of the vomer and its junction with the quadrilateral cartilage or the ethmoid, and (3) the junction of the anterior border of the ethmoid and the cartilage. These are the three most common sites of spines and ridges.

3. *Affections of other portions of the nose.*—Many cases of deviation requiring operation are found in patients with high-arched palates. Not infrequently the stigmata left by adenoids, or even remains of these growths, are evident. As the high-arched palate encroaches on the space of the nasal chamber (p. 95), the thin and pliable septum cannot develop normally in the restricted and unyielding chamber in which it is confined, and therefore it tends to grow twisted.

4. The disproportionate expansion between the bony framework of the septum and the septum itself appears to me to be the chief predisposing cause, and in many cases also a sufficiently exciting one, although most deformities owe their origin to traumatism. Excessive development of neighbouring parts in the nose—the middle and inferior turbinals—has been suggested as acting by pushing over the septum to the opposite side. This interaction is probably in the opposite direction, i.e. the deviation is primary, and the hypertrophy in neighbouring parts is secondary and compensatory.

Extranasal exciting causes.—*Traumatism* is the most common of external exciting causes. This produces more or less disturbance or dislocation along the lines of junction of the ethmoid, vomer, superior maxilla, and quadrilateral cartilage (*see above*). Naturally, this would take place more readily during childhood, and a slight displacement at that age may frequently be seen becoming more marked as the septum grows. This increase, in such cases, may also be due to the callus thrown out in the efforts of nature to buttress up a weak junction.

In a large number of cases, both male and female, which demand relief, the nasal obstruction is often distinctly traceable to some blow or accident. In other cases there may be no history of traumatism, as the accident may have been looked upon as quite trivial at the time, and forgotten long before its consequences became evident. The probability that traumatism is a common cause is increased by the fact that deviations are much more common in males, who are more exposed to injuries than females. On the other hand, such observers as Zuckerkandl, Fletcher Ingals, and Asch are sceptical in regard to the frequency of this influence.

Blowing the nose habitually with the same hand has been mentioned as a possible cause,* but the deviation does not affect one side more than the other with sufficient frequency to justify this hypothesis.

* Morell Mackenzie, "Diseases of the Throat and Nose," ii., p. 434. London, 1884.

Pathological changes.—The deformities of the septum are often classified into spurs, deviations, and combinations of deviations and spurs.

Spurs.—A spur may consist of a crest or spine or thickening. It is chiefly cartilage, but, as it is usually found at the junction of cartilage and bone (at the sites mentioned in paragraph 2, p. 162), bone frequently enters into its formation. It may be limited—a small hillock on a broad base—or in the form of a ledge (Fig. 83).

Deviations are always most marked in the cartilaginous area of the septum, but the researches of Morell Mackenzie, quoted above, were carried out on dried skulls, and show how largely bone must enter into their formation. The deformity is said to take place more frequently to the left than to the right, but statistics do not show any great preponderance of one side over the other. The deviation may assume the form of a diffuse or cup-like bulge. Other forms have been compared to a "C," an "S," a tray, the swelling of a sail, or the inside of a saddle, while still others are angular or too irregular to merit any term except that of "crumpled" (Figs. 84 and 85).

The anterior free extremity of the quadrilateral cartilage may be displaced from its mesial position behind the central columella of the nose, and project into one vestibule (Fig. 86). This has been called a "dislocation," but is generally found to be part of a deeper deformity of the septum, with obstruction farther back in the same nostril, and possibly a deviation into the opposite nostril.

The mesial crus of the lower lateral cartilage may be displaced and help to obstruct one nostril.*

Secondary changes in the nose may be induced. The septum may be so deflected into one nostril that it impinges on the middle



Fig. 83.—Spur of nasal septum.

The outer dotted line indicates the track which a saw-cut is inclined to take, when directed from below upwards. It would not relieve the condition. The incision should follow the direction of the inner dotted line, i.e. it should at first be directed towards the middle line, to secure a good bite, and then upwards.

* L. H. Pegler, *Journ. of Laryngol.*, Dec., 1900.

or inferior turbinal, so that these bodies are ill-developed or atrophied (Figs. 101 and 102). The increased room in the opposite (the concave) side frequently leads to compensatory hypertrophy of both turbinals and also of the mucous membrane bordering the concavity of the deflection. In this way both nostrils may get obstructed. The outer nose is apt to be bent. The deformity may be entirely to one side, or else the twisting may be double, with the root of the nose directed to one side, and the tip to the



Fig. 84.—Deviation of the septum.

Semi-diagrammatic transverse section showing how both sides may be obstructed—on the right side of the nose by the convexity of the deformity, and on the left side by the free border of the cartilage projecting into the nostril.



Fig. 85.—Deviation of the septum.

Semi-diagrammatic transverse section of the deeper part of the nose illustrated in Fig. 84. Note the compensatory hypertrophy of the inferior turbinal in the patent nostril. This case could not be satisfactorily relieved by any other operation than a submucous resection.

other (scoliosis). Still, the external nose may be perfectly straight, and yet there may be marked septal deformity.

This classification of deformities into three groups is helpful for the purposes of study, but it is useless and even deceptive in practice. The anatomical irregularities of the septum are met with in such combinations that no artificial grouping can be made to embrace all varieties. Not only is it rare to find a spur without some deviation being present, but spur and deviation are often blended in one deformity. Bearing in mind how various are the shapes and sizes of such bony cavities of the skull as the mastoid antrum and the accessory sinuses of the nose, it is not surprising that the septum should present great variety in its irregularities.

Symptoms.—The patient's most usual complaint is of nasal obstruction, and inability to clear one or both nostrils, but any of the sequelæ of mouth-breathing may be present (*see* p. 94). In some cases no reference may be made directly to the nose, and yet the symptoms in regard to the voice, cough, throat, and chest may be traceable to septal deformity. Neuralgia and headache of an obstinate character are not infrequently due to a deviation which interferes with the aeration of the accessory sinuses (chiefly the fronto-ethmoidal), or to a spur which is so large as to be imbedded in the turbinals. Recurrent catarrh of the accessory sinuses, chiefly the anterior group, may be maintained by obstruction to the discharge from their ostia. Dry rhinitis, scabbing, and epistaxis may direct attention to a twisted septum. In such cases the convex surface may so obstruct the airway in front that dust is deposited on it, and then sets up superficial ulceration and bleeding. Or the scabbing and bleeding may come from the concave side, where the dust collects in the pocket of a deep depression.

The external deformity may alone be sufficient to demand relief.

Diagnosis.—This is obvious, if the nose is carefully examined with a probe under cocaine (*see* p. 20). The only mistake I have seen has been in overlooking a gummatous infiltration of both septum and turbinals. The slight amount of shrinkage produced by cocaine, the history of the case, and a careful general examination should prevent this mistake. Nasal obstruction or catarrh must not be attributed entirely to a deformity of the septum if hypertrophic rhinitis, polypi, sinusitis, adenoids, or other condition is the chief or equally important cause.

Indications for treatment.—It is remarkable how frequently septal deformities are met with in patients in whom they appear to cause absolutely no trouble. A spur or deviation does not require attention simply because it exists, nor even because it is very prominent. A large, limited spur on a comparatively straight septum, or a diffuse deviation to one side, may, particularly in a healthy and roomy nose, cause no symptoms; while a septum with a scoliotic or sigmoid deformity, or a spur in one nostril and a deviation in the opposite, may, particularly in a narrow or a catarrhal nose, be the cause of a long



Fig. 86.—Deviation with displacement of the free end of the quadrilateral cartilage from behind the septum cutaneum, causing complete obstruction of left nostril. (*From a photograph.*)

train of symptoms. The exact site of the obstruction, its interference with the air-way, and the drainage of the nose or the accessory cavities, must be carefully weighed against the symptoms complained of.

In some cases direct operation on the septum may be avoided, and the patient relieved, by attention to other parts of the nose. Thus, the catarrh should be treated, or polypi and turbinal hypertrophies removed, while nasal breathing may be encouraged, and perhaps assisted, by wearing some dilator at night (*see* p. 119). But the catarrh is only too frequently kept up by the condition of the septum, and then operations on the turbinals are only of temporary help, as the hypertrophic condition is likely to recur (p. 163), and it is important never to sacrifice more of the inferior turbinal than is necessary.

Operation is called for when the deformity of the septum causes external disfigurement, mouth-breathing, catarrh, or epistaxis. It may be required when such neuroses as hay-fever, sneezing, and asthma are aggravated by the condition. The septum may require straightening in order satisfactorily to carry out treatment on the accessory sinuses, or nasal polypi, or through the Eustachian tube. Deviations of the septum are seldom the direct cause of ear-trouble, but they maintain catarrh, prevent ventilation of the middle ear, increase any deafness due to otitis media, and hence permanent improvement in suitable cases can be secured by removing them. When atrophic rhinitis is limited to one nasal chamber, and that is a too roomy one, benefit may result from a resection which equalizes the thoroughfare through both nostrils.

Treatment.—The number of methods devised for correcting deviations of the septum is an indication of the unsatisfactory resources hitherto at our disposal. Only the most useful will be described, and then the indications for a selection will be given.

Spurs and ledges.—When it is judged that relief can be obtained by removing a spur or ledge, without attempting to correct any twist in the septum itself, the following methods may be considered:—

Galvano-cautery.—This should never be employed. It is tedious, apt to leave behind dry rhinitis or adhesions, and much better methods are at our disposal.

Forcible straightening, by attempts to fracture the septum with Adams's or similar forceps, is clumsy, unscientific, and ineffectual. By such attempts the resiliency of the septum is not overcome, since it only bends and does not break.

Knife, saw, and spokeshave.—The first of these may be employed when the part to be removed consists of cartilage only. Such a condition is rare, and the organization of the scar is apt to leave as much obstruction as there was originally. The saw employed in the nose may be bayonet-shaped, or quite straight such as that of Cresswell Baber, Goldsmith, Woakes, or Holbrook Curtis (Fig. 87). This last gives a better purchase, and can be more quickly worked, than the original hand-saw shape of

Bosworth. When possible it is introduced beneath the deformity, directed inwards for the first few strokes, and then carried upwards, care being taken that it does not shear off too soon, and also that no perforation is made (Fig. 83). The sawn fragment is often left attached by the muco-perichondrium at one side; this can be cut through with scissors, or twisted off, or a spokeshave is introduced behind and swept forward, severing the attachment and



Fig. 87.—Straight nasal saw.

bringing out the spur. The spokeshave can also be used again for smoothing down the wounded surface. If the saw is not employed before the spokeshave, the latter is apt to slip off the prominent ridge and only shave its summit.

Operators accustomed to intranasal manipulation would first reflect the muco-perichondrium covering the spur, as described on p. 171. This would avoid the tedious healing by granulation and scabbing which otherwise occurs when the septum is wounded. In any case, the nostril is cleaned, and if sufficient room has been secured it may be left without any packing. Washing out with a simple alkaline lotion (Formula 8) is begun at the end of forty-eight hours. If the mucosa has been preserved, or adhesions are feared, the nostril may be packed with cotton smeared with vaseline (p. 174), or a Lake's rubber splint will serve well for keeping the surfaces apart (Fig. 88).



Fig. 88.—Lake's rubber nasal splint.

Perforation of the septum not infrequently takes place accidentally during attempts to remove redundancies. But it may also be made on purpose to increase the air-way, and is then carried out with the saw, as above described. The opening is made as far back as possible, and should be sufficiently large not only to admit enough air, but to remove the chief part of the obstruction. Any attempt to make and thrust the margins farther towards the middle line, where they are maintained by plugging for some weeks, is not only painful but useless, as it disregards the resiliency in all deviated septa. If a perforation approaches within half an inch of the orifice of the nose, it may give trouble

owing to the whistling noise when air is respired quickly, and the scabbing produced by the deposit of dust. But when it occurs farther back, patients are often quite unaware of a large perforation, and may be much relieved by one.

The *hinged-flap operation* of Hajek, Gleason, and Watson consists in making a U-shaped cut around a deviation from its convex



Fig. 89.—The Gleason-Watson operation for deformity of the septum.

a, The incision made from the stenosed nostril, and below the convexity; *b*, the septum as pushed into the free nostril; *c*, the result after subsequent removal of the spur.

surface, leaving this flap attached at its base, and then pushing the free margin into the opposite nostril, where it is retained by a Mayer tube, Lake's splint, or vaselined cotton plugs, until healing is complete.* (Figs. 89 and 90.)

In *Asch's operation* incisions are made through the cartilage before it is forcibly replaced in the middle line. Suitable scissors (Fig. 91) are used to make a crucial incision over the most prominent part of the deviation (Fig. 92). The four triangular flaps thus formed are snapped through at their base with fingers or forceps. This destroys their resiliency, and the four flaps are thrust into the middle line, where they are retained with hollow vulcanite splints.†

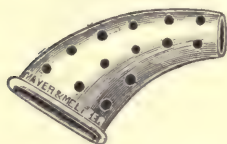


Fig. 90.—Mayer's nasal plug.

Moure's operation consists in making two cuts through the septum with suitable scissors, one parallel to the floor of the nose, and the other parallel to the bridge of the nose. The deviated portion between these two cuts is now

* E. B. Gleason, *Laryngoscope*, xii., 1902, No. 8, p. 578, and xxiii., 1913, No. 12, p. 1129.

A. W. Watson, *Trans. Amer. Laryngol. Assoc.*, in 1896, p. 218; and 1907, p. 192.

† Max Thorner, *Journ. Amer. Med. Assoc.*, Jan. 6, 1900.
Emil Mayer, *Med. Record*, Feb. 5, 1898.

sufficiently mobile to be pushed into the middle line, where it is maintained by a dilating splint.*

The *trephine* and *electrolysis* have been superseded by better methods.



Fig. 91.—Scissors used for dividing the cartilage in Asch's operation.

Objections to the above operations.—Although one or other of the preceding operations may secure relief in certain cases, there is not one of them which leaves the septum in an absolutely plumb line and gives the utmost possible patency to the nostrils. None of them is of any avail in some very scoliotic or crumpled septa, particularly those where the obstruction is situated high up in the region of the ethmoid plate, or low down near the orifice. The hinged-flap operation is likely to obstruct the formerly free nostril; it seldom gives complete relief; there may be a good deal of reaction after it, and it may leave a perforation. The Asch and Moure operations are suitable when we have to deal with a simple deviation,

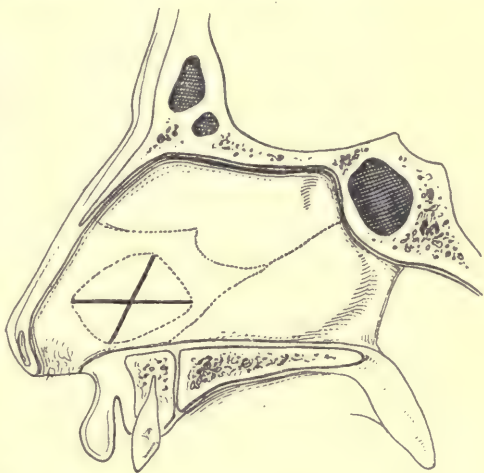


Fig. 92.—Asch's operation for deviation of the cartilaginous septum.

The crucial incision forms four flaps, and these are bent into position from their bases—indicated by dotted lines.

limited to the cartilaginous septum. As this is a very rare occurrence, subsequent operations may be required to ensure any relief.

* Moure, *Rev. Hebdomadaire de Laryngologie*, xxi., 1901, No. 13, p. 369.

Moure, *Journal of Laryngology*, xvi., 1901, p. 163.

L. H. Pegler, *ibid.*, xix., 1904, No. 4, p. 316.

Callus is apt to be thrown out, reproducing the obstruction. The prolonged after-treatment is tedious and painful. A plug or splint is distressing, risky, and unsatisfactory: in Moure's operation it is left in position for eight days; in that of Asch it has to be renewed daily for a month. Treatment by perforation only finds its indication in a very limited number of cases. It is useless for septa in which approach to the accessory sinuses or Eustachian



• Fig. 93.—Resection of septum.

Making the incision from the convex side, while the forefinger of the left hand acts as a guard in the opposite nostril.

tube is impeded. Crusting, risk of adhesions, and prolonged and painful after-treatment are frequent drawbacks.

None of these objections is applicable to the operation now to be described.

Submucous resection, or window resection.—This has been evolved by several workers, but in its present form it is chiefly the design of Killian, with technical improvements by Freer and Ballenger.* The operation can be carried out under cocaine, unless the patient is very nervous, or there is much bone to chisel away, when chloroform should be administered. The nose is prepared with cocaine

* See Bibliography in the author's "Submucous Excision of Deviations and Spurs of the Nasal Septum." London, 1906.

and adrenalin, as described on p. 75, and a few minutes before starting the operation some crystals of cocaine are applied with a damp swab over the site of incision. The submucous injection of cocaine advised by Killian appears unnecessary.*

The incision is made with a bayonet knife or small scalpel on the convex surface (Figs. 93 and 94), and the muco-perichondrium is carefully peeled off the cartilage over the whole extent of the deformity. If not already divided at the first incision, the cartilage is then cut through in the same site. A sharp-pointed detacher is next introduced



Fig. 94.—Resection of septum.

The incision is made on the convex side, through muco-perichondrium and cartilage, from *B* to *A*. If the free end of the quadrilateral cartilage is displaced from behind the septum cutaneum, and presents in one nostril, then the incision is made from *b* to *a*.

from the convex side, through the opening in the cartilage, but without button-holing the muco-perichondrium of the concavity, which is raised to the same extent as the opposite flap (Fig. 95). A long-bladed pair of Thudichum forceps or Killian's long duck-bill speculum is introduced into the nostril from the convex side (Fig. 96), and one blade is inserted on each side of the exposed septum. The cartilaginous portion is removed at one sweep of the Ballenger swivel knife (Fig. 97). The pocket thus left between the two flaps is wiped out, and the bony parts of the deformity are removed with a stout pair of Hartmann or Jansen-Middleton forceps. To remove a large or deep-lying spur, it will often be necessary to expose the nasal spine of the superior maxilla and remove it with chisel and forceps (Fig. 98). This

* G. Killian, *Beiträge zur Anat., etc., des Ohres, der Nase und des Halses*. Probeheft vii., S. 183.

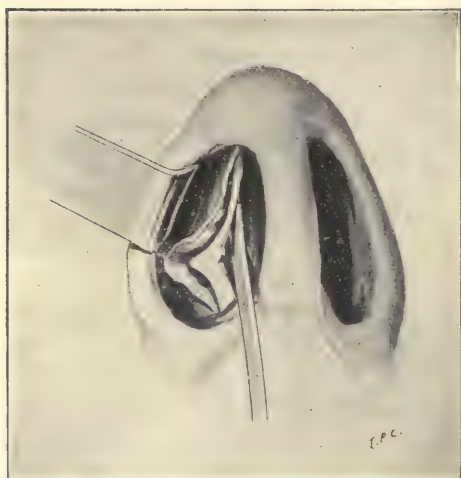


Fig. 95.—Resection of septum.

The muco-perichondrium has been raised from the convex side of the septum, and the cartilage has been cut through from *B* to *A* in Fig. 94. The dull-edged detach-er is shown separating the mucous membrane from the concavity of the deflection.



Fig. 96.—Resection of septum.

Semi-diagrammatic drawing of horizontal transverse section of the nose, viewed from above. The deviated septum has been divided in front, and its muco-perichondrium has been stripped up on each side. The nasal speculum is introduced through the convex nostril, and a blade is inserted on each side of the septum, between it and its mucous covering.

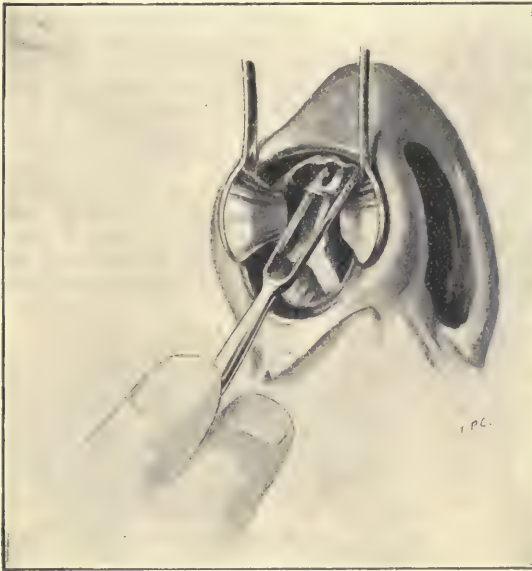


Fig. 97.—Resection of septum.

The method of employing Ballenger's swivel septum knife for cutting out the cartilaginous deviation.



Fig. 98.—Resection of septum.

The arrows indicate the points where the chisel may be applied when exostosis of the nasal maxillary spine requires removal.

gives very free access to the lower part of a spur, and as this is comparatively thin it is easily snapped through with chisel or punch-forceps, and the overlying spur lifted out (Figs. 99 and 100). This part of the operation is generally the most important, but it is often the most difficult owing to the close adherence of the periosteum, the greater tendency of the bone to bleed, the failure of cocaine to deaden the increased sensitiveness of the area, and the difficulty of working along the floor and in the depths of the nose. No operation is complete until, on letting the two flaps fall together, the fleshy septum is absolutely plumb in the middle line, and there is a free air-way in each nostril, from the olfactory region above down to the floor, and right back to the posterior choana and the front wall of the sphenoid. The formerly concealed middle and inferior turbinals should come well into view (Fig. 101).

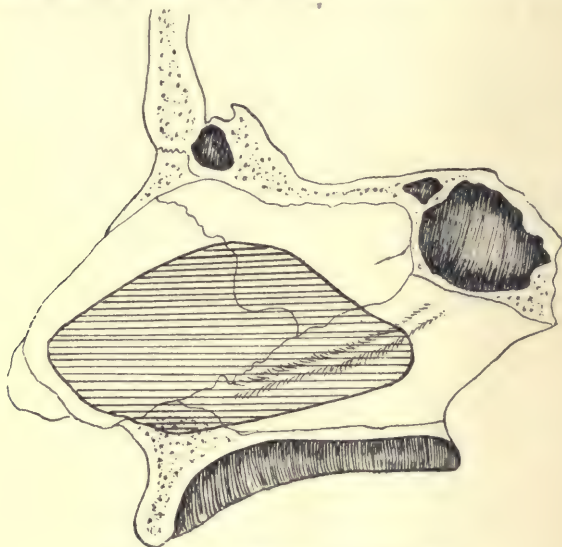


Fig. 99.—Resection of septum.

The shaded area indicates the extent of bony and cartilaginous septum usually requiring removal.

Blood and fragments of bone or cartilage are wiped out of the pocket between the two flaps, the latter are allowed to fall together, and the incision is closed with one or two catgut sutures. Each nostril is lightly packed with 2-inch strips of rubber-sponge or pencils of tightly rolled cotton-wool, smeared with sterilized vaseline, so as to obstruct the thoroughfare, but not so as to cause any painful distension. These are removed at the end of thirty-six to forty-eight hours, and are not renewed. A simple nose lotion is ordered to be used for a week or two, and a little menthol ointment can be smeared into the wounded side. The patient should not blow his nose for the first week, but should suck any secretion backwards into the naso-pharynx and expectorate it. The nose will be fairly free at once, but the relief will be more marked at the end of three to six weeks.

For the last few years I have not removed all the broken-up septum. The greater portion of the deviation, after being detached, has been left lying warm and moist between the two flaps of muco-perichondrium until nearly the end of the operation. The portions of resected carti-



Fig. 100.—Resection of septum.

The shaded portion indicates the extent of cartilage and bone removed in marked deformity, with deflection of the free end of the quadrilateral cartilage into one nostril, as in Figs. 84 and 85.

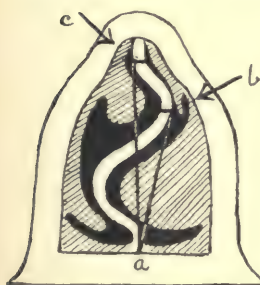


Fig. 101.—Deviation of septum.

Semi-diagrammatic transverse section of the nose to show the unsatisfactory result of an incomplete submucous resection. If the septum is only resected up to *b*, the fleshy septum will hang in the line *a b*, and the obstruction will not be relieved. The removal should be carried up to *c*, so that the septum will be quite vertical in the line *a c*.

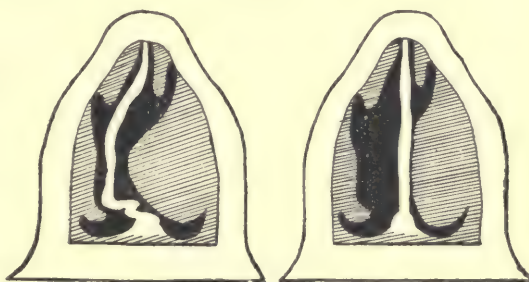


Fig. 102.—Resection of septum.

Diagrammatic transverse section of the nose. Shows the compensatory hypertrophy of the inferior turbinal in the unobstructed nostril. Part of this frequently requires removal after the septum has been straightened.

lage are then divided into pieces so as to fit, like a mosaic, into the "window" made in the septum; here they are held in place by the two flaps until, after suturing the

original incision, the rubber plugs have been introduced. These keep them securely in position. I have never had any trouble with the fragments necrosing away, and this plan has secured a rigid support and avoided all the drawbacks of a flapping septum.

Contra-indications.—1. Elderly people are so accustomed to their nasal obstruction, and its secondary consequences are generally so fully established, that the benefits would be much less marked than earlier in life.

2. It is well to avoid operation on the septum in young children, although Killian has operated on patients of 8 years of age with local anæsthesia, and even on children of 4 under chloroform.*

3. Serious or progressive organic disease.

4. Active syphilis.

5. Lupus.

6. Any symptoms of influenza or acute or infectious catarrh call for postponement of operation. Septicæmia and death, with symptoms of cavernous sinus thrombosis, have been recorded.†

Complementary treatment.—In any operation it may be necessary, in order to secure full benefit, to remove other obstructions, such as turbinal hypertrophies or adenoids (Fig. 102). The latter are best removed some weeks beforehand, in order to get quit of catarrh. Subsequent attention to alar collapse (p. 117), or mouth-breathing habits, may be required (p. 100).

Selection of operation.—Limited spurs or ledges on a fairly vertical septum, occurring in a nose otherwise adequately roomy, can be removed with a saw and spokeshave. A deviation of a septum into one nostril, particularly if there is no concomitant spur, can be relieved by producing a perforation as far back as possible. Such a condition may also be treated by a Moure or an Asch operation, and if it is associated with a spur or ledge, this may be subsequently removed in the manner advised.

These operations are best suited for fairly roomy noses. But as it is just in such noses that the ill effects of septal deformities are rarely felt, the indications for the above operations are seldom forthcoming.

In all other cases, in narrow noses, and whenever the operator is possessed of the necessary practice and skill, the submucous resection should be performed. It is suitable for every deformity, and will completely relieve even the worst. There need be no fear of collapse of the bridge of the nose and consequent deformity if sepsis is avoided, and a strip of cartilage is left (as seen in Figs. 99 and 100) like a bowsprit.

* *Beiträge zur Anat., etc., des Ohres, der Nase und des Halses*. Probeheft, 1908.

† Harold Hays, *Laryngoscope*, xix., Dec., 1909, p. 914.

ADHESIONS OF THE SEPTUM

Etiology.—Adhesions are, in most cases, consequent on surgical measures. Traumatism to opposite surfaces stimulates granulations which, in narrow nostrils, may come in contact and organize. When the galvano-cautery is blamed, the adhesion is generally attributed to accidentally touching the opposite surface to the one being treated; but, occasionally, an adhesion will form even when one side only is cauterized; possibly the heat of the cautery-point, even in the absence of contact, excites swelling and reaction of the opposite side. Adhesions are also left in the nose by measles, scarlatina, diphtheria, and syphilis; but cases are occasionally met with in which no history of these affections, nor of traumatism, is obtainable.

Pathological conditions.—The adhesion, of varying extent, generally occurs between the septum and the inferior turbinal, but it may also form between the septum and middle turbinal, or between the two turbinals. An adhesion may be a small, limited bridge of scar tissue, with a free passage above and below; or, as in ineffective septum operations, it may extend over a large area. Lupus or syphilis, when affecting the vestibule, may leave adhesions which completely obstruct the nostril.

Symptoms may be wanting. Discomfort depends on the situation and extent of the adhesion. If it obstructs the air-currents (*see* Fig. 6, p. 6), or interferes with the drainage of the nose, there will be some of the usual symptoms of obstruction and catarrh, with difficulty in blowing or clearing the nose (p. 92).

Treatment is not always called for if symptoms are absent. But if there is obstruction, catarrh, interference with drainage, or if it is necessary to free the nostril for the passage of the Eustachian catheter, or for intranasal treatment, the adhesion should be divided with scissors, and the cut surfaces may be kept apart by the free use of vaseline, or a white celluloid plate cut in the shape of a Lake's splint to suit the case (Fig. 88). The nose is cleansed daily, and the celluloid plate occasionally removed and purified. Sometimes it will be necessary to remove part of the inferior or middle turbinal (Figs. 72 and 76), or to rectify a spur or deviation of the septum.

Prevention.—More attention might be given to the nose during infectious fevers than is usually bestowed (p. 714). In intranasal operations care should be taken to avoid wounding opposing surfaces. Packing, in many cases, seems to favour rather than prevent

adhesions. It is better to watch the case, and break down with a probe any granulations spreading across, or keep them apart with a celluloid plate. If the adhesion is over a limited area, and proves obstinate, it is sometimes wiser to allow it to form, and leave it alone for some weeks. The adhesion will then be simply scar tissue, poorly vascularized, and if divided with the galvano-cautery at a white heat, or a knife, is not likely to recur.

Intranasal dacryocystostomy.—Much of the technique of this operation is similar to that required in submucous resection of the septum. It is described on p. 765.

CHAPTER X

FOREIGN BODIES. RHINOLITHS. PARASITES

FOREIGN BODIES

Etiology.—Foreign bodies may enter the nasal cavities (1) through the anterior nares, (2) through the posterior choanæ, or (3) by penetration through the walls. They may also (4) arise *in situ*, as in the case of necrosed sequestra and rhinoliths. This fourth group will be considered separately.

The majority of cases occur in children, who push into their nostrils—and generally into the right, as corresponding to the hand with which they pick up the articles—any of the small substances which they encounter in their games, or when crawling on the floor. The list includes buttons, beads, pebbles, peas, beans, fruit-stones, and the like.

Foreign bodies occur much more rarely in adults, in whom we may, in addition, meet with such things as pieces of cotton-wool, gauze, or sponge, which have been introduced during treatment, and either overlooked or only partially removed. Lunatics may thrust strange substances into their nostrils.

Foreign bodies may be driven from the pharynx up into the nose when something is swallowed “the wrong way,” and, in the efforts to arrest or expel it, is forced up into the choanæ. They may also arrive here when vomiting takes place suddenly or violently. This accident may occur, too, in neuroses of the soft palate and in œsophageal obstruction.

In those cases where the foreign body reaches the nasal cavity through its roof, floor, or walls, it is generally due to some external force, frequently a firearm. A Gordon Highlander in storming up the heights of Dargai was shot at from above, the bullet passing downwards through his forehead and destroying one eye. He suffered afterwards from a fetid discharge from one nostril for nearly two years, when it was entirely cured by the removal of the bullet and a fragment of khaki from the left nostril.*

* Claud Woakes, *Lancet*, 1900.

Antrum plugs may pass into the maxillary sinus, and then into the nose.

Pathology.—The foreign body is generally, in the case of a child, first introduced just within the vestibule, whence it is often pushed farther by the patient or the nurse in ineffectual attempts to remove it. It may produce only an insignificant amount of catarrh, or it may give rise to a fetid discharge, ulceration, and hæmorrhage. Sometimes it may become more or less encysted. If small, it frequently becomes the centre of a rhinolith.

Symptoms.—These will vary according to the size, nature, and situation of the substance introduced. They are frequently aggravated by unskilled attempts at extraction. When first introduced into the nose, a foreign body may give rise to a certain amount of discomfort or even pain, with sneezing and discharge. It may at once set up a considerable amount of reaction, though in other cases the introduction is followed by a period of tolerance which may last from a few days to ten or more years. During this time nothing may be noticed beyond a certain tendency to one-sided nasal catarrh, very much aggravated at times, when it may become fetid. Sooner or later reaction sets in, and is chiefly manifested by an ichorous, one-sided, fetid discharge, consisting of very offensive muco-pus, frequently blood-stained and mixed with grumous-looking material. In consequence of the nasal obstruction, mouth-breathing and snoring may develop, and headache, earache, conjunctival irritation, and various other reflex phenomena may be induced.

Examination.—In children it is difficult to make a satisfactory examination owing to their fear of all interference—possibly from previous ineffectual attempts at removal—the sensitive condition set up, and the fact that we have to use cocaine carefully in young subjects. If there appears to be no hope of securing by persuasion an inspection of the nasal cavity, it is perfectly useless to employ force. The examination and the removal of a foreign body require the greatest steadiness, and any sudden movement might produce considerable local injury. In such a case it is wiser to give a little chloroform. The anæsthesia need not be very profound to allow of a satisfactory examination, and the intruding body can generally be removed at the same sitting.

In most cases the foreign body lies in the inferior meatus, below the level of the vestibule, and out of the current of the air (Fig. 6). It is generally surrounded with such a quantity of secretion that inspection alone is insufficient to detect it. The nasal probe will at once reveal solid bodies such as stones, beads, buttons, and the like, and although it is not so serviceable in the case of frag-

ments of sponge or cotton-wool, yet it helps to settle their situation, mobility, and consistence. In using it, care should be taken that the probe does not push the substance farther back. The X-rays may be of help.

Diagnosis.—In many cases the diagnosis is helped by the history of the case, although in children this is not always forthcoming, either because the child is too young or too timid to say what has happened, or because the date of the introduction is too remote. In children a chronic unilateral discharge, especially when offensive, should always raise the suspicion of there being a foreign body in the nose and should lead to a thorough exploration of the cavity. From nasal diphtheria the case is distinguished by the enlarged glands, the constitutional reaction, and the general bilateral character of the latter disease. Membranous rhinitis is also, as a rule, bilateral. It is of course possible that a foreign body is present in each nasal chamber. However, if the suspicion of one being present is even aroused, inspection and the use of the probe will settle the diagnosis. In older subjects the same proceeding will distinguish the condition from empyema, a rhinolith, and syphilitic necrosis.

Prognosis.—There is no tendency to the spontaneous exit of a body which has become lodged in the nose; but when once it is removed, the symptoms it caused will rapidly disappear. It is frequently overlooked in practice, from a neglect to note the one-sided character of the discharge.

Treatment.—If the foreign body is small and recently introduced, the patient may succeed in blowing it out; or it may be expelled if a sneeze is excited by a pinch of snuff or by tickling the nostril with a feather. Great care and gentleness is required in removing a foreign body from the nose. The extraction should never be attempted blindly, and no force is ever required. As a rule there is no necessity for haste, and there can be little harm, in the case of a substance which has probably been in the nose for weeks or months, in waiting until all arrangements are complete for ensuring its satisfactory extraction. In adults this can generally be effected after the nose has been cocaineized, but in young children it is wiser to administer chloroform, as already recommended for examination, when, with the necessary instruments at hand, the examination can be completed and the removal carried out at one sitting.

In either case, after preparation with adrenalin and cocaine (p. 75), the nose being well illuminated and the nostril opened with a nasal speculum, the probe used for diagnosis will serve for gently levering or displacing the body and hooking it forwards.

Lister's ear-hook is very useful. With one of the forms of nasal forceps the object can be firmly seized and gently extracted, care being taken not to include any of the mucous membrane in the grasp of the instrument, nor to drag the foreign body out regardless of the sinuosities of the cavity. Fine probe-pointed forceps with serrated extremities are generally more certain of seizing a slippery substance and of doing less damage than larger instruments or those with spoon-shaped ends. In some cases the use of a snare is useful either to extract the substance or to tilt or drag it into a more suitable situation.

Unless coated with solid accretions, there is seldom any need to break up a foreign body; anything of a size to slip into the nose is small enough to be extracted entire, unless, like a pea or a bean, it has become swollen.

If it is found impossible to remove the body through the anterior naris, it may be pushed backwards into the postnasal space, where the forefinger of the left hand should be ready to prevent it from falling into the œsophagus or larynx.

A spray or nose lotion may be gently used for cleansing the affected nostril in order to obtain a good view of its interior or to help in disinfecting the discharge while awaiting further removal, but a liquid should never be forcibly injected into the nose with the idea of thus expelling the intruding substance. If the lotion is sent up the nasal chamber on the same side it only drives the body farther in. If injected up the opposite nostril there is risk of its causing otitis media.

In the case of small children, it is sometimes recommended that a piece of muslin be placed over the mouth, and that the practitioner should then apply his lips to those of the patient, and by blowing forcibly through the mouth drive out the foreign body by the blast of air from the postnasal space. Or the same method may be applied by insufflating the air from a Politzer bag through the opposite nostril. Both plans are alarming and rarely effective.

The **after-treatment** consists of some simple cleansing lotion to help in healing the inflamed mucous membrane, and possibly some boric ointment for the abraded nostril (Formulæ 8 and 74).

RHINOLITHS

Synonyms.—*Nasal calculi; concretions in the nose.*

Etiology and pathology.—Concretions are said to be more frequently met with in the nasal chambers of women than of men. They are usually unilateral. They are generally more or less irregularly spherical, but many show prolongations

according to the direction given to their growth by the spaces where they originate. Rhinoliths nowadays come under observation so early that large calculi are seldom met with. But in neglected cases they may be found weighing 85 grm., and causing symptoms which simulate a malignant growth.* The largest rhinolith recorded was as big as a hen's egg, weighed 110 grm., had destroyed the septum and turbinals, and required a Rouge's operation (p. 760) for its removal.†

The surface is rough like a mulberry or a mortar wall, and generally grey or brownish-black. Rhinoliths are friable, and crumble readily under pressure. On analysis they are found to consist chiefly of phosphate of calcium, although phosphate of magnesia, chloride of sodium, and the carbonates of lime, magnesia, and soda, and various organic bodies, such as mucin and protein, are also met with. These salts originate from the nasal mucus to some extent, but still more so from the tears. On section it is found that the salts have been deposited around a nucleus of some small foreign body, or perhaps some blood-clot or inspissated mucus. A true rhinolith, i.e. one formed around a nucleus of blood or mucus, is rare before the fourth year. A false rhinolith, i.e. when a foreign body becomes coated with salts, may occur at any age.

Symptoms.—These will, to a considerable extent, resemble those caused by a foreign body (p. 180). They may be very slight, and in mild cases consist only of a chronic one-sided catarrh. As the rhinolith increases, the symptoms of nasal obstruction become more pronounced, and the discharge shows evidence of the irritation produced. In some instances the symptoms may resemble those of caseous rhinitis (p. 151).

Examination.—With a probe the presence of some stony substance is revealed in the inferior meatus, and, if it is not coated with inspissated mucus, even a sharp click may be produced.

Diagnosis.—A complete diagnosis is often impossible until the rhinolith has been extracted, but the provisional diagnosis of the presence of some foreign body is sufficient (*see* Foreign Bodies, p. 179). From growths in the nose the diagnosis is made, with the help of a probe, by discovering that the substance is not attached, although it may be wedged between the turbinals and the septum. It is not always necessary to distinguish a rhinolith from carious bone or other foreign body, as it does not alter the treatment required.

* A. Bosch Melay, *Ann. des Mal. de l'Oreille*, xxxii., Jan., 1906, p. 91.

† R. Botey, *ibid.*, xxxii., Nov., 1906, p. 496.

It must be remembered that the rhinolith may be only part of the pathological condition, and that it may occur in connexion with hypertrophic rhinitis, polypi, empyema, and various conditions associated with excessive secretion.

Prognosis.—Once completely removed, there is no tendency for nasal calculi to re-form.

Treatment.—These concretions are almost unknown in children. With this allowance the remarks on the removal of foreign bodies will be found to apply to the extraction of calculi. With the use of cocaine, the cavity being well illuminated and all manipulations carried out under the guidance of the eye, they can readily be removed with a strabismus hook or pair of forceps. In some cases, owing to their prolongations into the recesses of the meatus, they may first require crushing. This may necessitate a general anæsthetic. Subsequent syringing out of the nose should be done from the opposite nostril.

PARASITES IN THE NOSE

Although the general title of "Parasites in the Nasal Fossæ" occurs in many text-books, it has been pointed out by Morell Mackenzie* that maggots and the like can hardly be termed parasites, for the essence of parasitism consists in the remarkable fact that one individual may live at the expense of another without any very serious results occurring to the animal fed upon.

The matter we have to consider might be placed under the general title of Animate Foreign Bodies in the Nose, and this would not only include the larvæ of insects, but also animals such as leeches. But the symptoms produced are so different from the usual run of "foreign bodies," and the animate bodies met with are so frequently maggots, that it seems better to consider the subject under the two titles of (1) Maggots in the Nose, and (2) Entomozoaria in the Nose, such as leeches and earwigs.

I. MAGGOTS IN THE NOSE

Synonyms.—*Myiasis narium*; larvæ in the nose; screw-worms in the nose; animate foreign bodies in the nose; *peenash* (a term used in India).

This affection is not uncommon in India, South America, and other tropical countries, but, fortunately, is extremely rare in temperate climates. As met with in the natives of hot countries, it is apt to be associated with extensive ulceration of the tissues of the nasal cavities, destruction of the bones of the face, the

* "The Throat and Nose," ii., 448. London, 1884.

production of pain, epistaxis, septicæmia, and sometimes convulsions, coma, and death.

Etiology.—The condition is brought about by the development within the nose of the larvæ hatched from the eggs which certain flies have deposited there. These flies appear to be allied to our own blue-bottle or house fly,* and are therefore attracted by anything like putrid meat, which affords the suitable nourishment for their larvæ when hatched. Hence it is that this distressing affection is most commonly met with in those who are already the victims of *ozæna*, syphilitic disease of the nose, and other purulent nasal affections, the flies being attracted by the fetid odour to deposit their eggs in or near the nasal cavities. It is rare for this to take place with a healthy mucous membrane, and the latter is so well provided with defensive arrangements (p. 6) that there would be little chance of the eggs being hatched. The patency of the nostrils associated with atrophic forms of rhinitis, and the custom, among natives of hot climates, of lying sleeping out of doors in the daytime when flies are laying, as well as their frequent disregard of cleanliness, are also favouring circumstances. The name under which the disease is met with in India, "peenash," is used somewhat loosely and doubtless covers various other ulcerative processes in the nose.

The fly chiefly met with is the *Lucilia hominivora* or *Sarcophaga Georgina*. In Europe there are three kinds of flies, all belonging to the order of *Muscidæ*, which may deposit their ova within the nose or near its orifice. (Fig. 103.)

In one case I found that an hysterical female introduced maggots into the nose herself.

Symptoms.—The visit of the fly to the nose is seldom noticed. The incubation period of the eggs is so short that frequently within a day or two symptoms of irritation are set up. There is a sensation of tickling and of something moving about, soon followed by sneezing and a sanious, bloody discharge. The irritation may amount to a distressing degree of formication, with severe pain over the root of the nose, the vertex, and the occiput, leading to restlessness, fever, and loss of sleep. The discharge becomes thicker, more purulent, and very offensive; maggots may be discovered in it; and the epistaxis may become severe. Œdema of the eyelids and face ensues; abscesses form in the neighbourhood of the nose, and when they burst the enclosed larvæ escape.

On inspection of a marked case, it is seen that the interior of the nasal chambers has been more or less completely destroyed. The extent to which this may be effected can be realized when it is remembered that as many as two to three hundred screw-worms have sometimes been ejected from a single case. Not only is the mucous membrane destroyed, but the cartilages and bones undergo

* Vincent Dickinson, *West Lond. Med. Journ.*, ii., 1897, p. 203.

necrosis, and the accessory sinuses are opened or filled with larvæ and putrefying products. This state of things induces septicæmia, and all its train of symptoms—fever, rigors, sweats, and delirium. The horror and agony of the condition sometimes lead to suicide, or the scene is closed by the convulsions and coma which ensue on the involvement of the meninges.

In recent cases occurring in the southern States of North

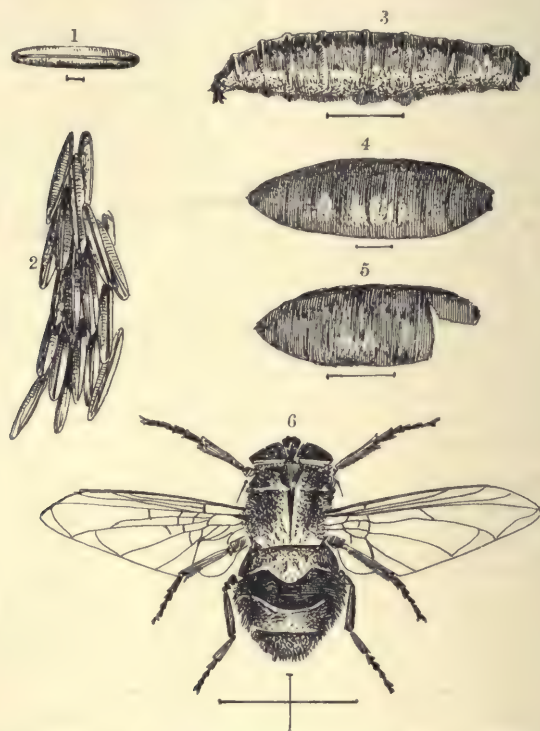


Fig. 103.—Various stages of the so-called Texas screw-worm, *Comptosia (Lucilia) macellaria*.

1, Single egg, greatly enlarged; 2, bunch of eggs; 3, larva ("screw-worm"); 4, pupa or chrysalis; 5, pupa-case, showing broken end where fly emerged; 6, screw-worm fly, wings expanded. (M. A. Goldstein.)

America, although there was considerable general reaction, with acute inflammation of the nasal mucous membrane and abscesses in the neighbourhood, yet prompt resort to medical aid appears to have averted local ulceration.* In a case brought before the

* M. A. Goldstein, *Laryngoscope*, iii., Dec., 1876, p. 335; and Jan., 1898. Hall Foster, *ibid.*, p. 341.

Laryngological Society of London the symptoms were only those of chronic rhinitis.*

Pathology.—The presence of the maggots and the destructive processes have already been referred to. In cases which have not received early treatment there is not only necrosis of the bony walls of the nasal cavities, but the accessory cavities have been invaded by the worms, and in fatal cases the meninges have been found to be inflamed.

Diagnosis.—Short of the actual discovery of the maggots in the nose, it is rather difficult to form a positive diagnosis. The symptoms mentioned, from their irregularity and in the absence of a satisfactory explanation, should arouse suspicions as to the possibility of infection by insects. According to some observers the screw-worms can, "as a rule, be easily seen and dislodged" by directly applying chloroform on cotton-wool.†

Prognosis.—Those cases which present themselves early are easily and satisfactorily dealt with. The outlook is grave in others which do not come under observation until extensive destruction of tissue has taken place, the deeper sinuses have become occupied by the larvæ, and general septic infection has set in.

Treatment.—The use of various antiseptics and germicides, however effective they may be shown to be against these larvæ when tested *in vitro*, is prohibited in the nose by the sensitiveness of the nasal mucosa. Fortunately there are two remedies which have almost entirely superseded the injections of turpentine, tobacco infusion, and lemon-juice, the insufflations of calomel, and other measures formerly employed. These two remedies are oil and chloroform. The former, which I mention first as it is nearly always at hand, destroys the insects by occluding their respiratory organs, and is innocuous to human tissues.‡ Olive oil or liquid vaseline may be either sprayed into the nostrils, or the nasal chambers can be entirely filled with it after the patient has been placed in the horizontal dorsal position with the head hanging over the edge of the couch. Chloroform was first recommended by Dauzats during the French expedition to Mexico in 1862.§ It may be mixed with an equal volume of water and syringed down the nostrils, or the vapour may be inhaled.

By either method the larvæ are at once detached and easily brought away. Of course, where destructive processes have taken place the appropriate treatment must be instituted.

* J. W. Bond, *Proc. Laryngol. Soc., London*, iii., March, 1896, p. 66.

† Hall Foster, *Medical Rec.*, Dec. 22, 1900.

‡ Scheppegegrell, *Laryngoscope*, iv., Feb., 1898, p. 86.

§ Morel, *Recueil de Méd. Milit.*, 3^{me} série, xiv., 1865, p. 516.

2. ENTOMOZOARIA IN THE NOSE

Etiology.—The list of animals which may be met with includes leeches, centipedes, earwigs, and ascarides. The possibility of leeches creeping up into the nose occurred more frequently in former times when their use was more general. They are still met with intranasally in patients who drink from stagnant pools. There are cases on record where centipedes have lodged in the nose or its accessory sinuses for months or even years. Earwigs are only found in cool climates, and chiefly during the autumn months. Ascarides are not infrequently met with post-mortem in the nose or larynx, but it is probable that in these instances they move up into the air-passages from the intestinal canal on the death of the patient. More rarely the worms have been expelled from the nose during life. The small crustacean *Artemia salina* has been washed out of the nose of individuals who have used a nasal douche of a patent sea-salt. Some of the eggs had probably dried off with the salt, and remained capable of developing under suitable conditions.*

Symptoms.—These will usually consist of formication in the nose, discharge, obstruction, vomiting, lachrymation, sleeplessness, and excitement.

Treatment.—Sternutatories may effect the expulsion of the various entomozoaria, but it is sometimes necessary to anæsthetize the patient while the nasal chambers are syringed with chloroform and water.

ASPERGILLUS

This fungus, usually the *Aspergillus fumigatus*, is rarely met with in the nose or accessory sinuses. Adults who come in contact with birds or horses may be attacked if they already have any lesion of the mucous membrane. The symptoms are those of a painless discharge of clear liquid with a characteristic mouldy odour, and nasal obstruction caused by greyish or greenish false membrane. Prognosis is favourable, as the condition quickly yields to simple cleansing measures.† (Cf. p. 310.)

RHINOSPORIDIUM

The *Rhinosporidium Kinealyi* is a sporozoon found by Major O'Kinealy in the nose, where it excretes a double cyst-wall.‡ This

* D. Harmer, *Royal Soc. Med.*, Laryngol. Section, vi., Feb. 7, 1913, p. 93.

† Niel, *Rev. Hebd. de Laryngol.*, xix., ii., 26 Août, 1899, p. 268.

E. V. Segura, *Proc. XVIIth Internat. Cong. Med.*, London, 1913, sect. xv., pt ii., p. 319 ("Les Mycoses des Muqueuses").

‡ O'Kinealy, *Proc. Laryngol. Soc.*, London, xi., Dec., 1903, p. 43.

James M. Beattie, *Brit. Med. Journ.*, Dec. 1, 1906, p. 1575.
Jonathan Wright, *New York Med. Journ.*, Dec. 21, 1907.

affection is rarely met with in India, and only among the natives. The growths bleed readily. They are met with on the anterior part of the cartilaginous septum, and resemble a raspberry or arbutus berry. Removal of the tumour, with cauterization of the base, is not followed by any recurrence. A section of the fresh growth is seen to be studded with minute white dots, which are found to be cysts filled with granular bodies. Each of these bodies contains about a dozen refractile granules, and there seems to be a pore in the cyst-wall through which the bodies escape into the surrounding tissues. Specimens stain fairly well by Gram's method.

CHAPTER XI

NASAL NEUROSES

ANOSMIA

Definition.—Anosmia, or loss of the sense of smell, is a symptom rather than a disease, but it is convenient to study the various causes of it in one section. This is the more important as the treatment will, of course, depend on the cause.*

Etiology.—For the normal perception of odours, three factors are essential :—

1. It must be possible for the odoriferous particles to come in contact with the olfactory region of the nose (Figs. 104 and 105).
2. The mucous membrane must be moist, and in a healthy condition.
3. The olfactory terminals and their nerve tracts must be normal.

It will be seen that interference with the sense of olfaction may therefore be (a) of a respiratory, or (b) of an essential character.

As one side of the nose is quite sufficient for the perception of odours, it is seldom that anosmia is complained of unless the affection is bilateral.

The loss of taste complained of by the patient is due to the abeyance of the perception of flavour, which depends on the sense of smell.

Examination.—The patient's own statement may generally be accepted with regard to the loss of the sense of smell, but it can be more carefully tested by the use of otto of roses, musk, valerian, and asafoetida. Care is, of course, taken to avoid the use of ammonia, vinegar, and other pungent vapours, which are recognized by the nerves of common sensation—the branches of the fifth nerve—and not by the olfactory. It may be necessary to determine if the anosmia is only one-sided. Its degree may be measured by Zwaardemaker's olfactometer.

Examination is then directed to seeing whether one or more of the following causative conditions are present :—

(a) **Respiratory.**—1. Misdirection of the air-current, caused by alteration or destruction of the alæ narium, which would allow

* Onodi and Zirkelbach, *Ann. des Mal. de l'Oreille*, xxx., ii., Déc., 1904, p. 654.

the air to be drawn along the floor of the nose, instead of being sniffed up into the olfactory region.

2. Prevention of access to the olfactory area, caused by alar collapse, facial paralysis, rhinitis, polypus, septal deviations, new growths, foreign bodies, suppuration, obstruction or stenosis of the choanæ, or adhesion of the soft palate to the pharynx.

3. Injury to the olfactory mucous membrane and nerve-endings, caused by rhinitis, atrophic rhinitis, ozæna, the habit of sniffing up cold water, cocaine, snuff, or nasal lotions, especially those containing carbolic acid, zinc, alum, or other astringents.

4. Damage to the olfactory nerves.

(b) **Essential.**—The diagnosis of essential anosmia should only be arrived at after eliminating the possibility of all the above-mentioned causes. Essential anosmia may be due to congenital absence of the olfactory bulbs and nerves. It is not uncommon as a neuritis from influenza, and has been traced also to lead-poisoning, tobacco-smoke, cigar-making, and malaria. The early stages of general paralysis of the insane and locomotor ataxy may affect the olfactory bulbs. Amongst other essential causes are fractures of the base of the skull, compression of the bulbs by meningeal lesions, and senile atrophy. It is only rarely that intracranial pressure produces complete anosmia. Compression of the cortical centres (uncinate convolution) or their association fibres might take place from abscess, gummata, tumours, and so forth, though it is improbable that these would be bilateral, and so induce complete anosmia; moreover, such lesions are not so likely to cause destruction of the centres as they are to produce symptoms of irritation, in which case they may be accompanied by subjective perversions of smell. Such subjective sensations are sometimes of value in localizing the cerebral lesion.*

In some cases anosmia is due to hysteria, when it is often associated with local anæsthesia, which can be detected with the nasal probe. It may be inhibitory, having been originated reflexly by some intranasal or other operation.

Prognosis.—This is good if the anosmia is dependent on any condition mentioned in the first two classes of the respiratory group (*a*). The sense of smell has been restored after a loss of forty years, when dependent only on nasal obstruction. In causes of the third class the prognosis is doubtful; and in those of the fourth class it becomes almost hopeless, except when the trouble is due to hysteria. In the last two groups the outlook will also depend on the duration, continuity, and intensity of the anosmia. It is always more promising if there has been any intermittence, but if the anosmia has been

* H. Campbell Thomson, *Brit. Med. Journ.*, Dec. 21, 1907.

complete and continuous for some months there is little hope of success. The prognosis is worse the less evidence there is of any lesion to explain the loss of smell.

Treatment.—In Class 1 a plastic operation or a well-adjusted false nose will effect a cure. In Class 2 we may have to correct the alar collapse, remove obstructions, or attend to adhesions of the false palate. All but the blandest nose lotions should, if possible, be avoided.

In the essential class (group *b*) the hysterical form is treated chiefly by suggestion. In the other forms, if well established, there is little to be done. Electricity is difficult of application and of doubtful value. Strychnine or quinine may be tried. The following snuff, to be used twice a day, is recommended by Lermoyez :—

℞ Strychn. sulph.	.	.	.	0·10
Pulv. iridis	.	.	.	0·50
Sacch. lactis pulv.	.	.	.	10·00

Hyperosmia, or increased sensitiveness to odours, is sometimes met with in hysteria, hypochondria, and mania. It may result from any lesion causing irritation of the olfactory bulbs.

Parosmia, or perversion of the olfactory sense, with subjective perception of imaginary odours, is always a central nerve affection. It may occur in influenza, hysteria, hypochondriasis, epilepsy, and insanity.*

Cacosmia, the perception of a bad odour, is generally due to local disease or foreign body. It is rarely subjective and due to disease of the nerve tract, but cacosmia may be one aura of epilepsy. It should always entail a careful exploration of the accessory sinuses, chiefly the maxillary.

SENSORY AND REFLEX NASAL NEUROSES

The nose is richly supplied with nerves, both sensory and vasomotor, rendering it one of the most sensitive regions of the body. Its susceptibility to irritation need not, therefore, cause surprise. This copious nerve supply connects it with the sphenopalatine, the Gasserian, and the superior cervical ganglia, and brings it into relation with the widespread branches of the sympathetic and the vagus (Figs. 104 and 105). Certain nasal reflexes are physiological, such as sneezing, lachrymation, cough, and the variations in turgescence and secretion. The neuroses of special sensation (olfaction) have already been studied (p. 190).

* F. St. John Bullen, "Olfactory Hallucinations in the Insane," *Journ. of Mental Sci.*, xlv., July, 1899, No. 190.

Nasal cough can often be excited by touching parts of the nasal mucosa, or the orifice of the Eustachian tube, with a probe. This cough may be due to different nasal or postnasal conditions, and is generally hard and dry, and ceases during sleep. It is usefully stimulated in laryngo-tracheal catarrh by washing or vigorously clearing the nose.

Abnormal reflexes are regarded by many as generally originating

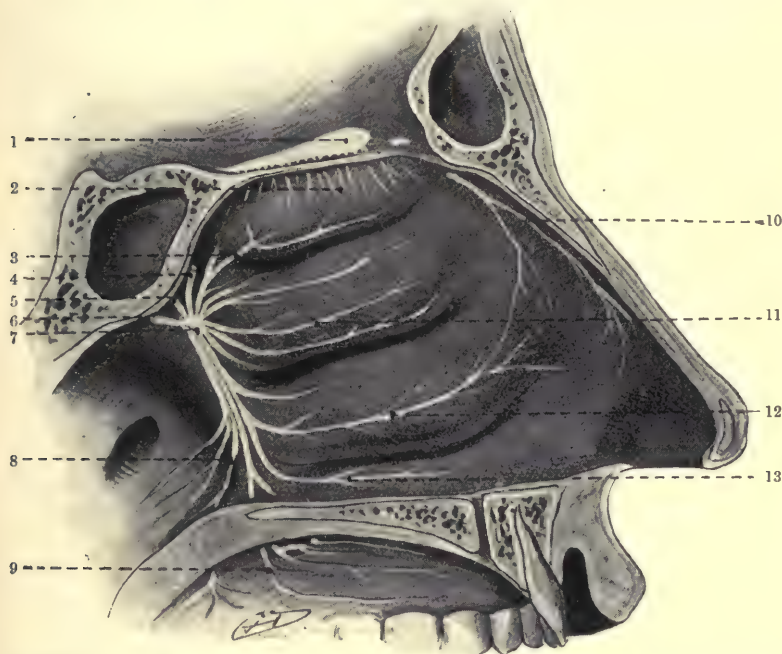


Fig. 104.—The nerves of the outer nasal wall (semi-diagrammatic).

1, Olfactory bulb; 2, olfactory nerves; 3 and 11, superior nasal branches of Meckel's ganglion to outer nasal wall; 4 and 6, superior nasal branches of Meckel's ganglion to inner nasal wall; 5, nasopalatine nerve; 7, Meckel's ganglion; 8, small posterior palatine nerve; 9, great posterior palatine nerve; 10, the nasal nerve; 12 and 13, inferior nasal branches of the great posterior palatine nerve.

in the following hyperæsthetic areas, first indicated by Hack :
 (a) The anterior extremity of the inferior turbinal. (b) The posterior extremity of the inferior turbinal, and corresponding area on the septum (J. N. Mackenzie). (c) The anterior end of the middle turbinal and opposite region on the septum—the tuberculum septi. (d) The region of the Eustachian orifice.

Anæsthesia, generally incomplete, may be left by many chronic affections, such as neglected polypi. More often it is functional, as in the hysterical. It may rarely be caused by intracranial

growths or syphilitic pachymeningitis, destroying the nerves of sensation.

Hyperæsthesia of the nasal mucosa need not be the only cause of a pathological reflex. It (1) may not only occur when the nerve-endings are abnormally sensitive, but it (2) may be due to susceptibility to particular stimuli, or (3) to defective control of the nerve-centres, or to a combination of these factors. Instances of

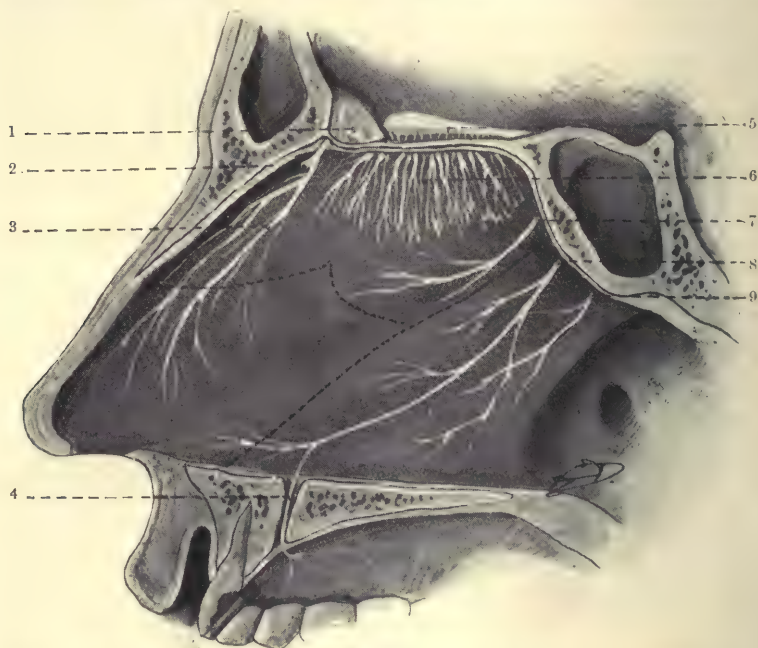


Fig. 105.—The nerves of the nasal septum (semi-diagrammatic).

1, Crista galli; 2, nasal nerve, divided (cf. 10 in Fig. 96); 3, septal branch of the nasal nerve; 4, naso-palatine nerve, of which a branch passes through the anterior palatine canal and is distributed to the incisor teeth (this explains why the patient says the front teeth "feel dead" when the septum is cocaineized); 5, olfactory bulb; 6, olfactory nerves; 7 and 9, superior nasal branches of Meckel's ganglion; 8, naso-palatine branch of Meckel's ganglion.

the first condition are shown by the sneezing which attacks many healthy persons under changes of temperature, or when passing into bright sunlight. Idiosyncrasy with regard to certain odours, such as those of horses, cats, dogs, certain flowers, and so forth, is referred to elsewhere (*see* Hay-Fever, p. 196). And, finally, the part taken by the central nervous system is shown by the onset of these troubles in patients who are neurotic, over-worked, worried, stricken by ill-health or grief, or in those who inherit an unstable nervous equilibrium.

A long list might be made of the various affections which, at one time or another, have been diagnosed as reflexly due to a nasal condition. The following are among the chief:—

(a) Exaggerated local affections—sneezing, rhinorrhœa, spasmodic rhinitis.

(b) Proximate affections—redness of face and nose, acne rosacea. In the eye—lachrymation, conjunctivitis, blepharospasm, scotoma, keratitis, glaucoma, asthenopia, and amblyopia.

(c) In the air- and food-passages—cough, dyspnœa, spasmodic laryngitis, asthma, bronchitis, spasm of the pharynx, functional dysphagia, and vomiting.

(d) Circulatory—palpitation, pseudo-angina pectoris, exophthalmic goitre.

(e) Nervous—neuralgia, migraine, supra- and infra-orbital headaches, vertigo, epilepsy, chorea, stammering, nightmare, enuresis, aprosexia, melancholia, twitching of facial muscles (histrionic spasm).

(f) Sexual—dysmenorrhœa.

Undoubtedly there is reflex action between the pituitary membrane and the genital organ. Bleeding from the nose is frequent at puberty.* Trousseau noted that the fetid odour of ozæna is increased during menstruation, and other observers have recorded its disappearance during pregnancy. Sexual disorders may be found to be productive of various troubles in the nose and throat.†

In many instances some of the disorders enumerated above may be directly caused by nasal conditions, without invoking the hypothesis of a neurosis. Thus, some may be due to direct extension of nasal catarrh (as in conjunctival and other ocular troubles); to nasal stenosis and consequent mouth-breathing (night-terrors, laryngitis, etc.); to septic absorption from sinus suppuration (melancholia, headache, retrobulbar neuritis); or to obstruction of the ventilation of the accessory sinuses (neuralgia). The recent and rapid progress of rhinology, by unmasking many unsuspected pathological conditions, has greatly curtailed the number of affections which were formerly looked on as simply reflexes of nasal origin.

It is worth recalling that treatment may seem to originate a reflex affection, as in those cases where a nasal operation may appear to start the symptoms of exophthalmic goitre (Semon), or incomplete removal of polypi may bring on a first attack of

* Joal, "De l'Epistaxis Gênitale," *Rev. de Laryngol.*, Fév., 1883.

† John N. Mackenzie, "Irritation of the Sexual Apparatus as an Etiological Factor in the Production of Nasal Disease," *Amer. Journ. of Med. Sci.*, 1884. F. Semon, *Brit. Med. Journ.*, Jan. 5, 1895, i.

asthma. In other cases, where nasal operation has been followed by giddiness, vertigo, faintness, paresis of the limbs, or exophthalmos, it is difficult to say whether the symptoms are due to a nasal reflex, to septic absorption, to the intimate relation between nasal lymphatics and the subdural and subarachnoid spaces, or to cocaine intoxication (*see* under Results of Operation, p. 83).

The diversity of view among various observers, and the large part played by suggestion in neurotic subjects, are exemplified in connexion with nasal dysmenorrhœa. This name was given by Fliess to cases of menstrual pain, of which he believed the true source was seated in the tubercle of the septum and the inferior turbinal. When these two points, called the genital zone, were anæsthetized with cocaine, the uterine pain ceased at once, and only recurred when the action of the drug had passed. To obtain a definite cure it sufficed, according to Fliess, to destroy the two points with a caustic or the galvano-cautery.* These observations were confirmed by Knorr, Koblauch, Schiff, Moll, and others. But Linder, substituting water for cocaine, found that suggestion alone could produce an equally wonderful effect.† Kuttner attributes the results to suggestion, the effect of the cocaine employed, or the general improvement in health which often follows the removal of any nasal stenosis.‡

To be nearly positive of a diagnosis of a purely reflex neurosis we must avoid attributing too much to a merely anatomical irregularity, and have absolute clinical proof (1) that the symptoms can only originate in the nasal mucous membrane; (2) that they can be completely arrested by applying a 10 per cent. solution of cocaine to the parts; and (3) that they can only be finally cured by direct treatment of the offending area.§

The question of reflex effects will enter into the study of several nasal disorders, but will be specially considered in connexion with hay-fever or spasmodic rhinorrhœa and asthma (*see* p. 202).

HAY-FEVER OR SPASMODIC RHINORRHŒA

Synonyms.—*Vaso-motor rhinitis*; *spasmodic rhinitis*; *paroxysmal rhinitis*; *paroxysmal rhinorrhœa*; *paroxysmal sneezing*; *intermittent neurotic catarrh*; *nervous coryza*.

Definition.—Intermittent engorgement of the nasal mucous membrane, associated with a free discharge of dilute mucus, frequently with paroxysmal sneezing and suffusion of the eyes, and sometimes with asthma.

* *Wien. klin. Rundschau*, 1895, Nos. 1, 2, 3, 5, 8, 9, 10.

† Barozzi, *Med. Press*, Aug. 12, 1903, p. 169.

‡ *Deut. med. Woch.*, 1908, No. 24.

§ Friedrich, "Rhinology, Laryngology, and Otology in General Medicine," p. 306. London, 1900.

G. Hudson-Makuen, *Amer. Med.*, vii, June 4, 1904, No. 23, p. 895.

In the nomenclature of this affection it has been thought best to preserve the title of hay-fever, which has become established by use, although it postulates a cause which is not constant. The title of vasomotor rhinitis shares in the same objections, while that of paroxysmal sneezing lays stress on one symptom which may be far from prominent in some cases and entirely absent in others. The name suggested by the late Sir Andrew Clark, intermittent neurotic catarrh, has the objection that it draws particular attention to a predisposing factor—the neurotic disposition. The title of spasmodic rhinorrhœa appears to be the least open to objection. It draws attention to the two most prominent features—the discharge and its intermittent character—while not claiming any etiological or pathological factor as characteristic.

Etiology.—Three factors are generally present in these cases: (1) personal idiosyncrasy, (2) a sensitive condition of the nasal mucosa, and (3) some external irritation acting on it.

The disease occurs most frequently in the neurotic, among the educated, refined, and overworked dwellers in cities. It is said to be more frequent in men than in women and children, and is generally met with between the ages of 20 and 30, but it may start in patients over 50. Hay-fever, or some allied affection such as asthma, may occur in several members of the same family. It is very common in America, and Anglo-Saxons are apparently more subject to it than other races. The view that it is dependent on excess of uric acid in the blood has been advanced by Seth Scott Bishop, and has received considerable support in America.* Future researches may show that it is connected with alterations in internal secretions or in the composition of the blood. Paroxysmal sneezing has been traced to sexual excitement or excess. In the nose we may be unable to detect anything which can be called pathological, or the probe may localize certain sensitive areas, although we are unable to say on what their irritability depends. These so-called “sensitive spots” are usually four in number: just above the tuberculum septi on each side, and on the anterior part of each inferior turbinal. In some cases hypertrophies, spurs, deviations, adhesions, polypi, or adenoids are met with.

Of external exciting causes the one generally accepted is indicated by the popular name of the malady. The action of the pollen of various grasses and cereals accounts for the frequency of the disease between the middle of May and the beginning of July. In America the attacks of catarrh in August are attributed to the pollen of the golden rod (*Solidago virgaurea*) and ragweed (*Artemisia absinthium*). The columbine (*Aquilegia*) has a specially bad reputation in this country. But spasmodic rhinitis may be stimulated by such irritants as the perfume of roses or other flowers, the exhalations of horses, cats, rabbits or guinea-pigs, and the dust of wood pavements or other sources. The reflex stimulus produced by cold feet or draughts, getting out of bed, passing quickly from the shade into bright sunlight, or even looking at a glaring surface, may start an attack.

The three etiological conditions are not present in all cases; two, or even one only, may be apparent, while instances occur where

* *Med. News*, Feb. 24, 1894.

“Diseases of the Nose, Throat, and Ear,” 3rd edition, p. 36. 1904.

no sufficient productive agent can be guessed at. The variety and temporary success of many kinds of treatment are looked upon as supporting the view that the neurotic element is the chief etiological factor. This is strengthened by such observations as the well-known one of J. N. Mackenzie, where an acute attack of spasmodic rhinitis was induced by giving a patient an artificial rose to smell!

Pathology.—The condition of the mucous membrane during an attack is that of passive engorgement. In some long-continued cases a condition of chronic hypertrophy ensues. An alteration of the blood picture has been found definitely associated with hay-fever.*

Symptoms.—A patient may feel in his usual health a few minutes before an attack. Then, without warning—it may be on getting out of bed in the morning, passing into the sun or into the shade, or on approaching a hay-field or a bunch of flowers—he feels a tickling or dryness in the nose, perhaps the same sensation in the conjunctiva, and a sudden attack of violent sneezing ushers in a discharge of profuse watery mucus from the nostrils. The sneezing may be so violent and uncontrollable as to cause ecchymoses in the conjunctivæ. In other cases there may be only one or two sneezes, apparently started by the trickling of fluid in the nose—for often, after an initiatory sneeze, and before he is able to get out his handkerchief, the fluid will stream from the patient's nose on to the work he may be engaged on. The nose rapidly becomes occluded, imparting a nasal twang to the voice; the ears feel stuffy; there is conjunctival irritation, photophobia, and lachrymation. Headache, chiefly frontal, and a feeling of heaviness and malaise accompany the attack, and sometimes a short irritating cough forms part of it. The breathing may be wheezy, and asthma may accompany or alternate with the attacks; the chest is often emphysematous. Spasmodic rhinorrhœa is very frequent when the patient rises in the morning, it may recur at any time through the day, though generally less severe, and a recurrence towards evening is not uncommon. There is complete cessation at night. The duration of an attack varies from a few minutes to an hour or more.

Examination.—During an attack there is swelling of the erectile tissue of the turbinals and increased secretion. The mucous membrane, especially that over the inferior turbinal, is often so swollen as completely to occlude the passage. If touched with a probe it is found to be elastic, the indentation which is caused re-filling at once, much as it would do with an air-cushion. There is

* E. Emrys-Roberts, *Brit. Med. Journ.*, May 30, 1914.

no real œdema, nor is there necessarily any hypertrophy. The application of cocaine produces some retraction and secures a more complete view, but the improvement is transitory. The colour of the mucous membrane is often described by writers as pink, but there is generally an apparent absence of an inflammatory reaction, and the surface is duller than usual, sometimes with a leaden or pale sodden appearance, or even a macerated look. The interior of the nose, between the attacks, may be perfectly normal in appearance. The secretion is generally so clear and so fluid that it is hardly visible in the nose. It may irritate the upper lip and give a red and inflamed appearance to the nostrils. In many patients the liquid falls from the nostrils in a steady drip. If collected it will be found to have the characters and reactions of the fluid of nasal hydrorrhœa (p. 205).

Diagnosis.—Many patients present themselves with their diagnosis ready made. The history of the case, the bilateral character of the discharge, the nature of the secretion, and inspection of the nasal chambers will exclude possibility of error.

Prognosis.—This must be rather guarded. If there are local conditions in the nose which probably aggravate the complaint, some relief may be hoped for from their removal. Where the attacks are produced by some external irritant the future comfort of the patient will, to a great extent, depend on his being able to escape them, for instance by change of climate or occupation. The disease is inclined to diminish in severity, and even disappear, after the age of 45.

Treatment.—The constitutional basis of the complaint should be kept in mind. Local treatment may only be of an alleviative character. During an attack any active local interference would but add to the irritability of the condition. Some relief may be obtained by inhaling steam medicated with benzoin, chloroform, camphor, or menthol (Formulæ 13 and 15), or from dry inhalations of menthol, eucalyptus, or sanitas oil. The routine prescription of cocaine in sprays, except in very small doses, and only for use in occasional attacks, should be avoided. The drug is apt to lose its effect, the relief is temporary, the secondary vaso-motor paresis tends to become chronic, and the patient is exposed to the risk of contracting the cocaine habit. Cocaine is the chief ingredient of many secret remedies. The same objections apply to the administration of opium or morphia. During an attack, as the sneezing is very exhausting, the patient should rest, preferably in a darkened room. Relief to the general feeling of malaise may be secured by the administration of the bromides, or of phenacetin, antipyrin, pyramidon, or some similar drug, in

strong black coffee. If the attack is of an asthmatic type, some of the various anti-asthmatic papers or cigarettes may give relief.

The local use of suprarenal extract cannot be recommended. The temporary ischæmia it produces is followed by increased irritation, discharge, and obstruction.

"Pollantin" is the name given by Dunbar to an antitoxin obtained by animal inoculations with a toxin extracted from certain grasses and cereals. This serum is used locally in the nose. In some cases it only produces violent paroxysms of sneezing; * in others it is useless; † while some practitioners record cures in 60 per cent. of cases, and relief in 30 per cent. ‡ It is advised to start treatment with liquid pollantin before the attacks begin, and to persevere with it in small doses. Treatment by active immunization with a pollen vaccine ("pollacine") is reported to be successful in a large number of cases, and the immunity thus acquired seems to last for one year at least after treatment has been discontinued. §

In the intervals, or before the usual period for the onset of hay-fever, if sensitive spots are discovered in the nose they should be cauterized with trichloroacetic acid (p. 69). || The galvano-cautery has not only been applied to these spots, but has been greatly abused by recklessly destroying areas of healthy tissue. Still, if used cautiously, it will often secure relief with very little damage to the mucous membrane, and, in such a depressing and persistent affection, alleviation at that cost is not to be neglected. Applications to the boggy area over the tubercle of the septum may be made on each side at intervals of a week; this may be followed up by cauterizing the lower anterior border of each inferior turbinal. The points to remember are that the benefit is not proportionate to the amount of tissue destroyed, and that the important functions of the inferior turbinates should always be respected. It is well to remember that the cautery may produce its effect (1) by inhibitory action, (2) by destruction of hyperæsthetic areas, or (3) simply by suggestion. A short course each spring may mitigate the severity of the summer catarrh.

Watson Williams recommends that at the beginning of the hay-fever season the nasal passages should receive one spraying

* Charles H. Knight, "International Clinics," vol. iii., 15th series.

† John N. Mackenzie, *Trans. Amer. Laryngol. Assoc.*, 1905.

‡ A. Lübbert and C. Prausnitz, *Berlin. klin. Woch.*, 1904, Nos. 11 and 12.

§ John Freeman, *Lancet*, Sept. 16, 1911, and *ibid.*, April 25, 1914, p. 1178.

A. G. Haynes Lovell, *Lancet*, Dec. 21, 1912, p. 1716.

Robert A. Cooke, *Laryngoscope*, xxv., 1915, No. 2, p. 108.

J. L. Goodale, *Trans. Amer. Laryngol. Assoc.*, 1915.

|| Killian, *Laryngoscope*, xvii., May, 1907, p. 341.

with a solution of biniodide of mercury (2-5 per cent.), the application being preceded by cocaine and followed by a hypodermic of morphia. The preliminary use of cocaine is also required before painting the nasal mucosa with the following mixture of Sir Andrew Clark's:—

Glycerini acidi carbolici . . .	3i . . .	30°0
Quininae hydrochloridi . . .	3i . . .	4°0
Hydrargyri perchloridi . . .	gr. ¼ . . .	0°015

This is often followed by considerable reaction; if necessary, it is repeated on the second to the fourth day, but never more than three applications are required. Quinine in a spray (gr. i to 3i) or ointment (gr. xxx to 3i of vaseline) has been so well reported on, and its employment is so easy, that it is worth trying.

The irritation and burning of the eyes may be relieved by lotions of boric acid or sulphate of zinc, and the wearing of smoked glasses. Cotton-wool, medicated with formalin or menthol, sometimes gives relief when loosely tucked into the nostrils. If there are asthmatic symptoms, iodide of potassium or arsenic should be given.

The maxillary sinus has been regarded as an etiological factor, and good results are claimed by Schadle from cleansing this cavity and washing it out with 25 per cent. nitrate of silver solution.*

Surgical interference may be called for if there are diseases or deformities which justify treatment on other grounds than that of hay-fever. The latter may be benefited by the removal of nasal obstruction, but it is rare for an inveterate, well-marked case of hay-fever to be cured by intranasal operation. In very aggravated cases, Lack recommends the removal of both middle turbinals, and even of all four turbinals.

General treatment, based on a careful examination of the patient's type and constitution, is called for in all cases. Anæmia, constipation, errors of diet, overwork, idleness, uncorrected errors of refraction, want of air and exercise, may require consideration. The asthma is often greatly aggravated by dyspeptic disturbance set up by sleepless nights and unsuitable remedies. Great benefit then follows attention to digestion. Relief may be obtained in some cases by giving half a minim of liquor atropinæ with 3 or 5 drops of liquor strychninæ. This is repeated in two hours if required, or according to symptoms, until the physiological effects are produced. Atropine and nux vomica can be given in a pill

* *Med. Record*, May 25, 1907.

morning and evening, and the action of the atropine watched. The following pill has been found successful by J. B. Ball :—

℞ Ext. belladonnæ . . .	gr. $\frac{1}{20}$ - $\frac{1}{12}$
Arsenii iodidi . . .	gr. $\frac{1}{16}$
Quininæ sulph. . .	gr. 1
Ft. pil., i. t.d.s.	

Valerian, valyl, arsenic, iodide of potassium, bromides, salicylates, phosphide or valerianate of zinc, the various phosphates and glycerophosphates, are among the drugs which may be prescribed. One drop of carbolic acid in an ounce of decoct. cinchon. flav. has been recommended. Rest cures, hydrotherapy, or electric treatment should be tried to prevent the worst cases from getting into the hands of the quacks and charlatans who thrive on this disease.

Prophylaxis embraces the avoidance of the external irritant. When this is traced to some periodic visitant, such as flowering plants, it can be escaped by those who are able to take long sea-voyages. The island of Heligoland is a favourite resort.† Some cases are benefited, and others made worse, by the seaside; some find relief by spending the summer in a large city away from pollen, and by remaining much indoors during June and July. Where irritation of the conjunctivæ is a marked feature, they should be bathed with a boric or other lotion for some weeks before the expected attack, and protected by goggles. A visit to the arsenical waters of Mont Dore or Bourboule, or to the alkaline or sulphur springs of Ems, Royat, or Cauterets, is often attended with relief, particularly in those cases where the affection is not so clearly dependent on some external factor and is more akin to asthma.

Where it has been found beneficial, the use of pollantin, or limited applications of trichloracetic acid, or the galvano-cautery, should be commenced before the onset of the hay-fever period. If the patient reacts to "pollacine," as tested on the conjunctiva, preventive immunization should be started with the beginning of the year (p. 200).

ASTHMA AND THE NOSE

The generally prevailing view is that bronchial asthma is a neurosis, in which the respiratory system is predominantly concerned, though reflex relations with other regions are often manifested. Cardiac and renal asthma are omitted from the following discussion.

* *Lancet*, Feb. 11, 1899.

† Thost, *Lancet*, 1902, July 5, p. 49.

The pathology of bronchial asthma is uncertain. According to one hypothesis it is caused by spasm of the bronchial muscles, while another explains it as a vaso-motor dilatation of the blood-vessels of the bronchi. Be that as it may, the connexion between asthma and the nose has long been recognized. Bosworth, indeed, goes so far as to state that "a large majority if not all cases of asthma are dependent upon some obstructive lesion of the nasal cavity."* Greville MacDonald says that he is "prepared to give a good prognosis to any asthmatic, whatever his symptoms, if he presents any degree of persistent engorgement or true hypertrophy of his anterior inferior turbinals."† And A. Francis goes even farther. His statistics, as interpreted by MacDonald, show "that whatever the state of the nose, free or obstructed, with a healthy or unhealthy mucous membrane, the great majority of asthmatics, be their asthma catarrhal or spasmodic or cardiac (whatever the latter may mean), are to be cured by cauterizing the upper part of the triangular cartilage."‡

The relationship between the nose and attacks of bronchial asthma is emphasized by laboratory as well as clinical experience. By the application of weak electrical currents to the nasal mucous membrane, Lazarus was able to register a distinct increase in the intrabronchial pressure.§ Brodie and Dixon have produced spasm of the muscular walls of the smaller bronchioles by stimuli applied to the nasal septum.||

Every asthmatic patient should have his nose examined, and, if necessary, treated. If polypi are present, or if there is polypoid degeneration of the ethmoid, these diseased conditions can be cleared away (pp. 131 and 225) with good prospect of considerable, or even complete and lasting, relief in a large proportion of cases, particularly in those where the disease did not begin in childhood. Removal of adenoids should always be advised, as their presence increases the discomfort during an attack, and cure has, in some cases, followed operation. Turbinal hypertrophies should only be treated according to the usual indications, as their association with asthma is uncertain. Deviations and spurs can be left alone, unless their removal is required for other reasons (see p. 165).

If hyperæsthetic areas in the nose are detected by the probe,

* "Diseases of the Nose and Throat," 3rd edition, 1897, p. 135.

† *Brit. Med. Journ.*, Nov. 5, 1904.

‡ *Ibid.*

§ *Deut. med. Woch.*, xvii., 1891, S. 852.

|| "The Pathology of Asthma," *Trans. Path. Soc., London*, liv., 1903, p. 17.

"The Bronchial Muscles, their Innervation, etc.," *Journ. of Physiol.*, xxix., 1903, No. 2.

and bronchial symptoms are mitigated or abolished by painting them with cocaine, it is permissible to try the effect of destroying these spots with trichloracetic acid, chromic acid, or the galvano-cautery (pp. 67 and 69).

When the nasal cavities are normal, a trial may be given to the method so warmly recommended by Francis. The septum is cocainized, and a very small area on one side below the tubercle is lightly touched with the galvano-cautery. The opposite side is cauterized at a subsequent sitting, and the applications are not repeated until the former burns have healed. Several sittings may be required. As the amount of ciliated epithelium destroyed is very small, no great harm results in the event of failure. In some cases the benefit is marked, though not permanent, and in many there is no relief. One cannot help thinking that suggestion enters largely into the question.

Cocaine, and the various secret remedies of which it is the chief ingredient, should only in rare instances be placed in a patient's own hands; and on no account should an asthmatic be allowed to become possessed of a hypodermic syringe for morphia injections.

General treatment can never be neglected. Neurasthenia must receive suitable hygienic treatment, with appropriate tonics of iron, phosphorus, valerian, etc. Iodide of potassium or arsenic will give relief in some cases. I have seen attacks cut short by a hypodermic injection of 1 to 3 minims of adrenalin chloride, but alarming symptoms have been reported by others. The paroxysms may be controlled by inhaling the fumes of stramonium or chloroform, or by a spray of nitrite of sodium (gr. ii to 3ii) or one of the non-toxic proprietary preparations.

The chronic asthmatic will often be considerably relieved by visiting a health resort, where he can benefit by the pulmonary gymnastics of slow hill-climbing, or by the breathing exercises with compressed air and pneumatic chambers, combined with alkaline sprays. Among such are Harrogate, Mont Dore, Cauterets, Ems, Wiesbaden, and Baden-Baden. For further suggestions readers are referred to textbooks of general medicine.

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NASAL HYDRORRHŒA

Synonyms.—*Rhinorrhœa*; *rhinal hydrorrhœa*; *dripping from the nose*; *coryza vasomotoria periodica*.

Definition.—A rare and obscure nasal affection characterized by profuse discharge of watery fluid from the nostrils, without marked visible changes in the nasal chambers.

Nasal hydrorrhœa owes its existence as a separate affection to the prominence given to it by Bosworth in a study of 18 cases.* With the progress of knowledge hydrorrhœa tends to disappear from our list of diseases, and only remains as indicating a symptom. An investigation of Bosworth's cases shows that six of them were dependent on pathological conditions of the nose or its accessory cavities, and that in nine the fluid probably only traversed the nose on its way from the cranial cavity, so that his clinical picture is built up on three cases.†

When a profuse watery discharge from the nose is met with, the term nasal hydrorrhœa should not be employed if we find that it is dependent on any intranasal pathological changes (hypertrophies, polypi, septal spurs, or new growths); if the fluid is cerebro-spinal; if it originates in the accessory cavities; or if it forms one of the manifestations of some nervous affection, such as trigeminal neuritis. The title should be reserved for those cases in which a secretion of certain chemical characters appears to be poured out from the nasal mucous membrane, but without visible pathological changes and without evident sources of irritation. Many cases approach in character to hay-fever (p. 196).

Etiology.—The affection is one of adult life, and appears to attack males and females indifferently. The sufferers from it are generally of the same type as those who are affected with hay-fever. It may show a certain periodicity, but is not directly affected by climate or season.

Pathology.—There are no marked changes, either gross or microscopic, in the mucous membrane of the nose. Bacteriological examination has revealed nothing characteristic. The fluid appears watery as it falls from the nose, but when collected it is generally viscid, slightly opalescent or turbid. It can be poured from one glass to another, but leaves strings of mucus. It is faintly alkaline; with acetic acid or alcohol it gives a stringy precipitate of mucin; it contains a small amount of albumin (protein) coagulable by heat, and it does not reduce Fehling's solution. Under the microscope it shows amorphous matter and mucus corpuscles, and contains 1·208 per cent. of total solids. When the fluid amounts, as it does sometimes, to a pint or more in the day, it is less viscid and much weaker in mucin.

* "Diseases of the Nose and Throat," i., 258.

† StClair Thomson, *Brit. Med. Journ.*, Oct. 22, 1898.

Symptoms.—In many cases there are symptoms of intense local irritation which resemble those of hay-fever, while in others the only discomfort complained of is a passive and painless watery nasal discharge. The fluid generally escapes from both nostrils, although it may be more marked on one side than the other. It may vary in amount from a few ounces to a pint or more in the twenty-four hours. The handkerchief used becomes stiff on drying, as if starched, showing the abundance of mucin. This is an important point as distinguishing the liquid from that of cerebro-spinal rhinorrhœa. The flow rarely continues during sleep. It is apt to be erratic in its onset and in its intermission.

Diagnosis.—This is based on the characters of the fluid, and the exclusion of any intranasal or neighbouring source of irritation. Care must be taken to diagnose simple hydrorrhœa from cerebro-spinal rhinorrhœa.

Prognosis.—The affection is without serious menace to life. Spontaneous cessation will frequently occur. There are several remedies which are generally successful in mitigating the discomfort of the complaint.

Treatment.—This should be similar to that of hay-fever. The profuseness of the flow can often be checked by the administration of atropine and strychnine (p. 201). The constant current is recommended by Cresswell Baber.* Calcium chloride, in doses of 30 to 45 gr. a day for two weeks, is warmly supported by Lake.†

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CEREBRO-SPINAL RHINORRHOEA

Synonyms.—*Dripping from the nose; escape of cerebro-spinal fluid from the nose.*

Definition.—A rare condition in which the cerebro-spinal fluid can escape from the anterior fossa of the skull and pass into the nose.

Symptoms.—It has long been known that after injuries to the base of the skull the cerebro-spinal fluid can make its way into the nasal chambers, but it does not appear to have been positively

* *Proc. Laryngol. Soc., London*, v., Jan., 1898, p. 29.

† *Brit. Med. Journ.*, July 9, 1910, p. 79.

established as a pathological possibility that this escape could take place spontaneously, until the publication of a monograph by the author with a critical study of 21 cases.*

From this it appears that the chief, and often the only, complaint of the patient is of a constant and long-continued dripping of watery fluid from the nose, generally from one side only. When collected, the fluid is found to be free from taste, smell, and sediment; albumin and mucin are practically absent from it; and when boiled with Fehling's solution there is a reduction of the copper. This is due to the presence of glucose, and, as this soon ferments and disappears, the test must be carried out on a freshly collected specimen.

Diagnosis.—It is important to distinguish this rare occurrence from other forms of rhinorrhœa. This result is reached to some extent by a process of exclusion, and also by noting the properties of the fluid, and the fact that when handkerchiefs soaked with it are dried they remain soft and can be used again, whereas those moistened with ordinary nasal discharges dry stiff owing to the quantity of mucin in the secretion.

Prognosis.—The condition does not appear to be amenable to any treatment, although in some instances the flow has ceased spontaneously, and it will often intermit for irregular periods. Several of the cases recorded have been followed by changes in the retina and blindness, and by cerebral symptoms and death. Possibly these accidents will become rarer when the true nature of the condition is recognized in good time.

Pathology.—It has not been established by what route the fluid escapes from the skull into the nose. It might be along the perineural sheaths of the branches of the olfactory nerves; or by a communication between the subarachnoid space and the lymph-channels of the nose; or by a simple solution of continuity in the dura mater lining the anterior fossa of the skull.

Treatment.—No remedy has been suggested, and it is important to refrain from all intranasal treatment so as to avoid the risk of infection being conveyed to the meninges. In a recent post-mortem I found the cause to be a syphilitic pachymeningitis.

* "The Cerebro-Spinal Fluid; its Spontaneous Escape from the Nose. With observations on its Composition and Function in the Human Subject." By StClair Thomson. London, 1899.

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CHAPTER XII

INNOCENT AND MALIGNANT TUMOURS

BENIGN NEOPLASMS OF THE NOSE

TUMOURS in the nasal chambers are comparatively rare, and innocent tumours are more uncommon than malignant ones. Mucous nasal polypus, the most common new formation met with in the nasal chambers, is no longer regarded as a myxoma or even as an œdematous fibroma. It is, as we shall see, a result of chronic inflammation.

The benign neoplasms met with in the nose include (1) papilloma, (2) fibroma, (3) angioma, (4) osteoma, (5) enchondroma, (6) exostosis, and (7) cysts.

I. PAPILLOMA OF THE NOSE

This is one of the rarest forms of new growths in the nose. Owing to the confusion with papillary hypertrophy, which unfortunately received the name of "Hopmann's papilloma," several cases have been recorded as papilloma which evidently had no right to that title. There are in literature only about fourteen cases of true papilloma in which the diagnosis has been confirmed by histological examination.

Papilloma is rarely met with in the vestibule of the nose (Fig. 70, p. 120). Here it is really a skin affection, showing under the microscope the character of the typical papilloma, and, as on other parts of the cutis, it is apt to recur.

Symptoms.—A papilloma in the nose will make its presence felt by nasal obstruction and catarrh. Occasional attacks of hæmorrhage are more apt to occur in this form of nasal obstruction, and it may, in neglected cases, cause symptoms of pressure, the nose expanding externally, the flow of tears being obstructed, and the eyesight interfered with on the same side. The septum may be pushed over to the opposite side. But there is no bulging of the palate, the growth does not generally invade the choanæ, and the glands are not enlarged.

Examination.—This will sometimes reveal an external swelling of the nose and interference with the flow of tears. Inspection

will show the anterior and lower part of one nasal chamber obstructed by a growth which will vary in size according to its age. It may completely obstruct the nasal passage, or possibly a probe can be passed round it. This will show that the attachment is generally to the septum, and more rarely to the inferior turbinal. The growth is movable, and the pedicle narrow. The surface may appear smooth, or may be rough, like a mulberry or a cauliflower. In some instances it is grey, and in others a dull red. It is apt to bleed, though not profusely, when touched.

Pathology.—The rough or mulberry surface of this kind of growth somewhat resembles the papillary hypertrophies which have already been described; but the microscope reveals an entirely different structure. Being a true papilloma, the structure consists of a delicate branching connective-tissue framework, containing many blood-vessels with ill-defined walls, and everywhere covered with many layers of epithelial cells distinctly demarcated from the subjacent tissue.

Diagnosis.—Both the situation and the size of the growth will help to distinguish it from ordinary papillary hypertrophy. More care is required in diagnosing the tumour from a malignant neoplasm, as the tendency to hæmorrhage, the age of the patient, and the naked-eyed appearances may all be suspicious. Even recurrence after removal would not necessarily entail malignancy, as small accessory papillomata are sometimes encountered. As these have an origin distinct from that of the main growth, they may be overlooked when the latter is removed, and then their later development might give a misleading idea of malignancy.*

There is not the tendency to ulceration and free hæmorrhage which is so marked in malignant nasal disease.

Prognosis.—This should be somewhat guarded until the tumour has been freely removed and a satisfactory portion has been submitted to the microscope.

Treatment.—When the nasal cavity has not become entirely obstructed, the growth can be removed through the anterior naris by means of the nasal snare. The base of the tumour should be dried and well cauterized with chromic acid, pure nitric acid, or the galvano-cautery.

If the growth is of considerable size before the patient presents himself, and if there is any bulging of the exterior of the nose, it may be necessary to obtain access to the tumour by an external operation, such as that of Moure or of Rouge (pp. 760-2).

In the *introitus narium* (Fig. 70, p. 120) the growth is very obstinate, recurring in spite of the use of acid nitrate of mercury,

* A. Logan Turner, *Arch. of Otolaryngology*, xxvi., 1897, No. 2.

glacial acetic acid, salicylic acid, collodion, and other strong caustics. It is best destroyed with the galvano-cautery.

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2. FIBROMA

Fibrous new growths are exceedingly rare in the nose. Those which do occur generally take their origin from the posterior extremity of the middle or inferior turbinal, and project into the postnasal space, where they cause the same symptoms as the more-frequently-met-with naso-pharyngeal polypus (p. 343).

Pathology.—The growth is firm and irregular, but with a smooth surface. It does not bleed readily. Under the microscope it presents the ordinary characters of a fibrous tumour.

Symptoms.—A fibroma makes its presence known by the gradual development of nasal obstruction, generally limited to one side. For twenty-five or more years the stenosis may go on increasing, even bulging out the nose, and, if the growth descends into the postnasal space, pharyngeal symptoms and impaired action of the palate are added.

Examination.—Inspection, after a preliminary cleansing and cocainizing of the nose, will detect a smooth or granular, irregularly-rounded, opaque, dusky-grey, pink, or dull-red tumour. With the probe it is found to be dense and firm, and not particularly vascular. Manipulation with the probe will also reveal the origin of the growth from either the septum, floor, or one of the two lower turbinates. The middle one is the favourite situation. Detection of the point of implantation will depend on whether the pedicle is short or long, and hence on the growth being more or less fixed. In some cases the growth will project from the anterior naris, and in others it may only be discernible in the postnasal space.

Diagnosis.—This seldom presents any difficulty unless, as seldom happens nowadays, the tumour has been allowed to grow to such an extent that it has invaded the accessory cavities of the nose, pressed out the pterygoid fossæ, or descended into the pharynx. When, in addition, the surface has become ulcerated

and bleeding, a suspicion of malignancy may arise, but it will be noted that the glands are not affected, and that the growth has simply acted mechanically on the structures it grows over, without actually invading the tissues. From the fibromata of the nasopharyngeal space these growths are to be distinguished by their occurrence at a later age, by slower growth, by less marked vascularity, and by their point of origin being within the nose.

Prognosis is always good.

Treatment.—This growth can nearly always be satisfactorily removed by the nasal snare, as described on p. 232. If so large



Fig. 106.—Fibroma of the nasal septum. (*Life size.*)

The growth, when fresh, measured 4" \times 2½" \times 5½". (*W. R. H. Stewart.*)

(Fig. 106) that it is impossible to get the wire loop round it, a Rouge's operation may be necessary.

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3. ANGIOMA

Synonyms.—*Bleeding polypus of the septum; discrete angioma of the septum; fibroma polyposum fungoides teleangiectodes septi narium.*

Definition.—A pure angioma is rarely met with, and most of the vascular growths encountered are fibro-angiomata. In connexion with this subject, it is well to remember that marked vascularity is a feature of all septal neoplasms.

Etiology.—This is unsettled. As the growth generally springs from Kiesselbach's area (Fig. 64, p. 112), it has been thought that

it might be due to rhinitis sicca or local traumatism. It may occur between the ages of 6 (Norval Pierce)* and 70 (Wyatt Wingrave).

Symptoms.—Frequent and severe epistaxis from one side of the nose, which at the same time is more or less obstructed, should always demand a careful inspection of the interior of the cavity.

Examination.—This will reveal a tumour either sessile on the cartilaginous septum or attached by a thin pedicle. It is dark red and bleeds easily. The tumour is round, and generally smooth, although it may be somewhat mulberry-faced. The size varies from that of a small pea to a hazel-nut. In cases which have been neglected the growth may be large enough to obstruct the nose more or less completely, and from exposure to dust or irritation the surface may be ulcerating, while the repeated hæmorrhages will have given rise to the suspicion of malignancy.

An angioma sometimes originates from the ala, the adjoining floor of the nose,† the anterior end of the inferior turbinal,‡ or the posterior end of the inferior turbinal.§

Pathology.—Some main points in its morbid histology are as follow :—“ It is either a pure granuloma (then probably immature, and traumatic in origin) or, and much more commonly, a granuloma of doubtful etiology which has early undergone angiomatous change, spongy or cavernous, in a stroma which has certain of the characters of the succulent nasal mucosa. If, when sessile, a section is carried through to its cartilaginous base, no morbid affection of the latter or of the adjoining mucosa is seen, and if, after imperfect removal, it recurs, its angiomatous character is reproduced. Its histology is not affected by site—e.g. septum, floor, or ala of the nose—nor by length of pedicle. Proneness to ulceration, and hence to bleeding, is due to bacterial invasion of the epithelium from without. The abundant endothelioid cells, though they may be heaped somewhat around a blood space, do not produce a picture which can be mistaken for sarcoma.”—(Pegler.)

Diagnosis.—If the growth is attached in the centre of Kiesselbach's area, and its appearance coincides with the above description, the diagnosis should be easy. If the attachment is lower down and more forward, it must be distinguished from lupus, papilloma, fibroma, and ordinary papilliform hypertrophy. The free bleeding and tendency to a rapid, fungating recurrence after incomplete removal, and occasional indefiniteness of microscopic sections, have not infrequently led to a mistaken diagnosis of sarcoma. But a round-celled sarcoma—the most frequent—is soft, fleshy,

* *Journ. Amer. Med. Assoc.*, Feb. 19, 1898, p. 402.

† W. H. Kelson, *Proc. Roy. Soc. Med.*, Laryngol. Section, Jan. 3, 1908, p. 33.

‡ Somerville Hastings, *ibid.*, March 4, 1910, p. 102.

§ G. Wilkinson, *ibid.*, Nov., 1911.

and friable ; if a portion is removed the recurrence rapidly exceeds the original growth, and it rarely forms a distinct pedunculated mass. Careful microscopic examination of a removed portion should always settle the question.

Treatment.—After the application of cocaine and adrenalin, bleeding polypus of the septum can be satisfactorily removed with the cold-wire snare. The growth should be constricted as near the base as possible, and the loop narrowed slowly so as to permit coagulation to take place. After removal, the base should be well scraped with a sharp spoon, and then seared with the galvano-cautery. The eschar may be touched with pure carbolic acid. No after-treatment is required, beyond a little ointment to prevent the formation of crusts, and the patient should be warned against blowing his nose violently until the scab separates. A tendency to re-formation of the growth is not necessarily an indication of malignancy. The site of the growth should be inspected at intervals for some time, and any appearance of recurrence should be freely cauterized.

The galvanic snare may also be used for the removal of these vascular growths. There is no need, as has been suggested, to excise the portion of cartilaginous septum from which the growth originates. Such a proceeding is quite unnecessary, and indeed care should be taken when using the galvano-cautery not to cause a traumatic perforation. This is best avoided by using the point at a cherry-red heat, cauterizing only a limited area and depth at one sitting, and allowing some time to elapse between each application. If it is difficult to surround the base of the tumour with a snare, two elliptical incisions may be made around it at



Fig. 107.—Periosteum detacher.

a short distance. By working down to the cartilage with a blunt detacher (Fig. 107) the muco-perichondrium bearing the angioma is easily peeled off the septal cartilage.

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 Marino Gaetano, *Pratica Oto-rino-laringoiatrica*, Anno vi., Dicembre, 1906, p. 20.
 Vincenzo Cozzolino, *ibid.*, Agosto, 1906, p. 1.
 C. A. Parker and L. H. Pegler, *Proc. Roy. Soc. Med.*, Laryngol. Section, Dec. 6, 1907.
 J. Trautmann, *Arch. f. Laryngol.*, Bd. xx., Heft 3.
 Jörgen Möller, *ibid.*, Bd. xx., No. 1.
 Citelli, *Ann. des Mal.*, xxxvi., ii., 1910, No. 5, p. 433.

4. OSTEOMA

This is a rare form of neoplasm. The hard ivory variety is met with more frequently than the soft cancellous. It originates from the ethmoid region, septum, or floor, and may be attached by a short, slightly movable pedicle. In some cases the tumour lies free and unconnected. The size varies from a pea to a goose's egg. An osteo-chondroma may cause extensive absorption of



Fig. 108.—Ivory exostoses from the ethmoid bones (symmetrical).*

Portrait showing the symmetrical bulging, on each side of the nose, of ivory exostoses, which entirely blocked the nostrils. (*Sir Jonathan Hutchinson.*)

the cribriform plate, and spread into the sphenoidal and ethmoidal cells or the cranial cavity.*

Symptoms are those of gradually increasing obstruction, catarrh, and neuralgia.

Examination reveals a hard growth, generally pedunculated, and of a pinkish colour. Polypi may accompany and partially

* Robt. Myles, *Laryngoscope*, xviii., April, 1908, p. 305.

conceal the bony growth. This may extend in different directions, e.g. into the orbit, causing proptosis.* The tumours may be bilateral and symmetrical † (Fig. 108).

Prognosis.—In adults they can be left alone with safety if not causing inconvenience; for Sir Jonathan Hutchinson states that it is a law with most exostoses that they grow during the growth of the body, and cease to do so when full development has been attained. ‡

Treatment.—Small growths may be reached through the nostril with punch, chisel, hammer and forceps. Larger ones may require a Rouge's or a Moure's operation (pp. 760-1).

5. ENCHONDROMA

Enchondroma is very rare, and liable to degenerate into chondrosarcoma. It is met with generally in young males. It most often grows from the ethmoid, but has been found arising from the lower lateral wall, the frontal process of the superior maxilla, the septum, and from within the maxillary sinus. § The symptoms are those of obstruction and catarrh, developing slowly. It may produce external deformity. There is no tendency to epistaxis.

Treatment consists of intranasal removal. If, however, the growth has reached any considerable size, an external operation may be necessary.

6. EXOSTOSES

Exostoses are more common. They are met with on the floor of the nose and the lower part of the septum. They are sessile, rounded, and smooth, and covered with the unaltered mucous membrane of the part from which they spring. They are painless, very hard to the touch, seldom attain much size, but may cause obstruction.

Treatment is seldom required. Obstruction is best relieved by freeing the air-way in the neighbourhood. If necessary the exostosis can be removed with chisel and hammer after reflecting the muco-periosteum over it.

7. CYSTS OF THE FLOOR OF THE NOSE

The cysts about to be described are to be distinguished from those which occur in mucous polypi and those found in the anterior end of the middle turbinal.

* H. L. Lack, *Proc. Laryngol. Soc., London*, xi., Feb., 1904, p. 112.

† Otto J. Stein, *Laryngoscope*, ix., 1900, p. 27.

‡ *Polyclinic*, ii., April, 1909, p. 259.

§ W. Uffenorde, *Journ. of Laryngol.*, xxiii., May, 1908, p. 269.

The cysts found on the floor of the nose were first described by McBride.* They apparently occur chiefly in females.

Etiology.—According to Brown Kelly, who has closely studied the subject, these cysts have no connexion with the teeth. He regards them as simply retention-cysts. Other observers hold that they are always associated with some dental trouble.

Symptoms.—When small, these cysts may cause no inconvenience, and are often discovered accidentally. As they increase in size they may give rise to nasal obstruction and catarrh, and may cause some facial disfigurement by bulging out the ala nasi and upper lip.

Examination.—Inspection will reveal a light-grey or pinkish hemispherical swelling on the floor of the nose just behind the vestibule. As it increases in size it presses upwards and outwards, compressing the anterior extremity of the inferior turbinal, which then looks like the half of a "Philopena" almond. The cyst is sessile, and fluctuation is easily detected by placing one finger in the nostril and the other beneath the upper lip. On being punctured it gives exit to a thin, pale yellow fluid.

Progress.—The cyst may remain stationary for years, and give no trouble; or it may enlarge and cause local discomfort, neuralgic pains, and nasal obstruction.

Treatment.—If the cyst is small, it is sufficient to incise it and to allow of the escape of the contents. This may have to be repeated. If the cyst is larger, it is better to dissect it out through an incision in the gingivo-labial fold.

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MALIGNANT NEOPLASMS OF THE NOSE

Frequency.—Malignant growths are not very frequently met with in the nose. Primary carcinoma is rare. Donogany and von Lenart affirm that only 80 cases have been published before their own contribution of 7.†

Sarcoma is not so uncommon. Bosworth collected reports of 49 cases in 1889, Gibbs included them in 111 cases in 1902, and

* *Brit. Med. Journ.*, May 14, 1892, p. 1011.

† *Arch. f. Laryngol.*, xv., 3 (quoted in *Rev. Heb. de Laryngol.*, 1904, No. 38, p. 358).

in 1904 J. A. Watson based a study on the record of 150 cases reported since the middle of the last century.*

Pathology.—Carcinoma is met with in the form of squamous epithelioma, or alveolar carcinoma, chiefly in advanced age.

Any of the varieties of sarcoma may be met with in the nasal fossæ.† The investigations of J. A. Watson show that the small round-celled sarcoma is the most common; fibro-sarcoma comes next in order of frequency; myxo-sarcoma occurs about half as often as fibro-sarcoma. Then, in decreasing order, come spindle-celled sarcoma, melanotic sarcoma,‡ angio-sarcoma, and adeno-sarcoma.§ Osteo-sarcoma, myeloid, alveolar, and lympho-sarcoma have also been reported. Some of the growths formerly described as sarcomata are now considered to be cylindrical-celled carcinomata or endotheliomata, and are most malignant (Citelli).||

Pathological changes.—Epithelioma may present as an infiltrating malignant ulcer. A sarcoma may commence as a rodent tumour. When round-celled it is friable, fungating and ulcerates rapidly. Ulceration, sloughing, hæmorrhage, and septic changes are common to all forms. In their rapid growth they may block the cavity and distend and disfigure the nose, push over or perforate the septum, invade the accessory sinuses or orbit, perforate the cribriform plate, and project from the nostril or into the postnasal space (Fig. 109).

Enlargement of the glands occurs late in the disease, and metastasis is an extremely rare event.

It must be remembered that a malignant growth may originate in one of the accessory sinuses, generally the maxillary antrum, and then invade the nose; that oedematous tissue or even large myxomatous polypi may spring up around the neoplasm, and so help to confuse a correct diagnosis; and that malignant growths or fibroid polypus of the postnasal space may spread into the nasal chamber from behind.

There appears to be no foundation for the suggestion that innocent growths in the nose may become malignant, but it is not uncommon to meet with adeno-carcinoma.¶

Etiology.—The proximate cause, or causes, of malignant growths in the nose is as little understood as in the case of other

* *Amer. Medicine*, April 2, 1904, p. 553.

† Grosjean, *Rev. Hebd. de Laryngol.*, 1903, No. 2, p. 48.

‡ G. Wilkinson, *Journ. of Laryngol.*, xxvii., 1912, No. 1, p. 1.

§ Emil Mayer, *Amer. Medicine*, iv., 1902, No. 5, pp. 179-180.

|| Citelli and Calamida, *Arch. f. Laryngol.*, xiii., 2, 1902 (abstr. in *Rev. Hebd. de Laryngol.*, xxix., 1903, No. 2, p. 61).

¶ E. F. Hopkins, *Trans. Amer. Laryngol. Assoc.*, 1897, p. 74.

G. A. Leland, *ibid.*, 1897, p. 81.

Emil Mayer, *ibid.*, 1902, p. 80.

regions. The male sex is more commonly affected than the female. Sarcoma is met with at any age from youth onwards; the fifth decade appears to be relatively liable to the disease. Although the first decade is comparatively exempt, yet a malignant growth may be met with in childhood. Carcinoma is generally met



Fig. 109.—Lympho-sarcoma of ethmoid in a boy aged 16.

with in the old, although it may occur as early as the twenty-fourth year.*

Site of origin.—Malignant growths may originate anywhere in the nose, but particularly in the ethmoidal labyrinth and the palatine process of the superior maxilla at the junction of the floor and septum. More rarely they grow from the septum, though

* F. Semon, *Proc. Laryngol. Soc., London*, xi., June, 1904, p. 188.

sarcoma is not uncommon here. Of 80 tumours of the septum tabulated by Arslan,* there were—

29	cases of sarcoma.
19	„ „ polypi.
11	„ „ carcinoma.
8	„ „ papilloma.
4	„ „ angioma.
3	„ „ epithelioma.
1	case „ myxoma.
5	cases „ other varieties.

The growths may be pedunculated or sessile, and by ulceration they may secure fresh attachments; still, a tumour may fill a nasal chamber and even some of the accessory sinuses, and yet only be attached by its point of origin.

Symptoms.—A malignant growth makes its presence known by a unilateral catarrh, increasing obstruction, ulceration, discharge and epistaxis. Even when the tumour is of considerable size there may be no pain, but the patient may complain of much pain when the new growths are manipulated, and while they are being removed.† The progress of growth being generally rapid, a quickly increasing obstruction of one nasal chamber, particularly in an elderly subject who previously had adequate nasal respiration, should always suggest a close examination. This is the more necessary if there is any tendency to bleed, either spontaneously or when the nose is irritated. In this stage the general health may appear quite unaffected. In some cases, patients complain of nothing beyond the unsightliness caused by the distension at the root of the nose.

When the nasal obstruction is much advanced, and the growth has reached the spreading stage, the symptoms are those of (a) nasal obstruction; (b) bloody, fetid discharge, occasionally with severe spontaneous epistaxis; (c) radiating pains in the head, or acute trigeminal neuralgia; (d) broadened nose, widely separated orbits, and exophthalmos (frog-face); (e) infiltrated and swollen cheeks; (f) pains referred to the ear; (g) cerebral symptoms; and (h) enlarged glands. In this stage the affected nostril may be entirely obstructed by friable masses which sometimes project from the vestibule. The sense of smell may be diminished, and there is occasional epiphora, but the hearing is seldom affected. Rapid wasting with marked cachexia develops late in the disease, and this, or the onset of meningitis, causes death.

* *Arch. Ital. di Otol.*, iii., 1895, p. 32. (These statistics are interesting as showing the preponderance of malignant over innocent growths in the nose.)

† Walker Downie, *Glasgow Med. Journ.*, 1907, p. 103.

Examination.—In the early stage there will generally be found a growth which is bluish-grey, pink, or dark-red, with a surface that may be smooth or rough, soft, and bleeding readily on being touched. Even if pedunculated, such a growth should be viewed with suspicion, and all such neoplasms should be removed with a snare and submitted to the microscope. From an embryonic sarcoma a gumma might not be differentiated by the microscope, but the latter is distinguishable by other features.

Much of the most visible part of the growth, especially as it enlarges, presents the physical appearances, and even the microscopic characters, of ordinary mucous polypus, but suspicion as to its true nature will generally be aroused on noticing how free, and often persistent, the hæmorrhage is on probing or partial removal. The bleeding from an ordinary nasal polypus may be sharp for a few minutes, but is rarely persistent or recurring.

A more thorough examination, possibly after removal of part of the presenting polypoid tissue, will show that the growth is dark-red, rough, fleshy, vascular, firm to the probe, and not movable. By posterior rhinoscopy it will be seen that the neoplasm has in many cases invaded the posterior choana, and instead of appearing grey, smooth, and soft like mucous polypus, it is dark-red, and rough or mulberry-like. The septum may be pushed into the opposite nostril or be eaten through. It is important to remember that in malignant disease of the nose the glands are often not affected until the nasal growth has made considerable progress. In some cases the Röntgen rays give valuable information as to deeper ramifications and the invasion of neighbouring cavities.*

We are so unprepared in children to encounter malignant disease that it often escapes recognition until it has produced frog-face, exophthalmos, and the appearance described as characteristic of the last stage of the disease. (Fig. 109, p. 218.)

Diagnosis.—This must be made from innocent growths, foreign bodies, syphilis, tuberculosis, and rhinoscleroma. There are no characteristic features in a malignant nasal neoplasm to distinguish it by inspection from a syphiloma or a tuberculoma.

The diagnosis is facilitated by reference to what has already been said, and to the chapters on these various affections. Stated briefly, a malignant growth is indicated by a rapidly developing, one-sided obstruction; ulceration, fetid discharge, hæmorrhage; the discovery of a hard, immobile growth, which rapidly spreads to the tissues, and later on to the glands; and by the characters found under the microscope, and the negative results of

* O. Chiari and H. Marschik, *Ann. des Mal. de l'Oreille*, xxxiii., 1., Avril, 1907, No. 4, p. 305.

Wassermann's reaction and the administration of iodide of potassium and mercury.

Microscopic sections must be made from the deep parts of the growth. If they confirm the diagnosis made on etiological grounds, the question may be considered settled; but little weight should be attached to any microscopic testimony which contradicts a well-founded clinical diagnosis of malignancy. If, on the other hand, the microscope reveals malignancy where an innocent formation was suspected, it is wiser to treat the disease as malignant.

Prognosis.—This will depend on the variety, stage, and situation of the growth, and the age and condition of the patient. It is worse with cylindrical epithelioma and embryonic sarcoma than with pavement epithelioma or fibro-sarcoma. When the disease is well advanced before coming under observation, the prognosis is more gloomy than in those cases which are seen early. It is more favourable when the growth is near the floor of the nose, and becomes less so as it approaches the ethmoid region. Still, taking all these points into consideration, the outlook for malignant disease of the nose is not necessarily so gloomy as might be expected, and is less so than it was some years ago. This is probably due to an exact diagnosis being made earlier, a suitable selection of cases for operation, and the development of nasal surgery. Even a recurrence of growth need not be discouraging. A recurrence may take place after a clear interval of as much as seven years.*

A rapidly spreading, inoperable sarcoma runs its course in one to two years. In some countries, such as Egypt, it may occur in a quiet, polypoid form, which takes years to grow slowly.†

Treatment.—Cases may be considered according as they seem suitable for (a) intranasal operation, (b) external operation, or (c) only palliative relief.

(a) When a tumour is small, pedunculated, and growing anteriorly, it should of course be removed through the nostril. If the general condition of the patient is favourable, even large sessile growths which threaten the roof of the nose may be removed by the intranasal route. In some cases the nose may be entirely plugged by a bleeding, fungating sarcoma, and the glands enlarged below the angle of the jaw, yet, by intranasal treatment and removal of the glands at a separate operation, recurrence may not take place for two and a half years or more, and even the successive operations may secure long periods of comparative comfort.‡

* J. Payson Clark, *Trans. Amer. Laryngol. Assoc.*, 1903, p. 217.

† F. C. Madden, *Practitioner*, March, 1910.

‡ J. W. Bond, *Proc. Laryngol. Soc., London*, iii., May, 1896, p. 88.
H. L. Lack, *ibid.*, iv., March, 1897, p. 64.

The operation can be carried out under cocaine, but, on account of the free, sometimes furious, bleeding, it is better to prepare the patient beforehand (p. 83), administer a general anæsthetic, and plug the postnasal space (pp. 85).

The growth can then be removed with Luc's forceps, the wire snare, ring curette, spokeshave, and punch-forceps, as in operation on the ethmoidal labyrinth (p. 233). It is frequently advised to cauterize the base of the growth; it is difficult, on account of the bleeding, to do this at the time, but afterwards it may be attempted with the galvano-cautery or Paquelin's cautery.



Fig. 110.—Epithelioma of left maxillary antrum: operation by lateral rhinotomy: no recurrence after three years.

Note the trifling scar and absence of disfigurement.

If any base or remnant is visible, it is wise to remove it surgically at subsequent sittings.

(b) External operation is indicated when the growth is very extensive. The operation of Moure through the side of the nose is very suitable for growths situated high up or far back in the nose (ethmoidal or sphenoidal region), and the scar left causes but little disfigurement. (Figs. 307-9, pp. 761-3.) It is the best operation for dealing with a growth involving both the nose and the antrum, as occurs in many neoplasms of the ethmoid. By this method I have operated on extensive malignant disease of the ethmoid and antrum. In two cases—one a carcinoma,

(Fig. 110) and the other an endothelioma—there is no trace of any recurrence after three and five years respectively. Rouge's operation gives free access to both sides of the lower part of the nose, without leaving an external scar. (Figs. 305-6, pp. 760-1.)

Sometimes these two operations should be performed together.

If the lateral wall of the nose is much infiltrated, or if the growth has invaded it from the maxillary sinus, then a Rouge and a Caldwell-Luc operation can be combined. (Figs. 141-4, pp. 270-2.) The opening in the canine fossa is carried right through into the nose, so that one large cavity is made of the antral and nasal chambers, and the whole region right back to the postnasal space and up to the roof of the nose can be inspected and treated. Yet there is no external wound or disfigurement.*

Internal surgical treatment is simple, easy, and without danger. It can be repeated. It allows of seeing and removing the point of origin. There is no risk from hæmorrhage, and recurrences are easily watched. These are great advantages compared with the older methods.

In the operation of Ollier, described in textbooks on general surgery, the nose is reflected downwards from the root. It gives practically no approach to the roof of the nasal chambers, and is much inferior to Moure's operation. The other disfiguring operations of general surgery (Langenbeck, Dieffenbach), often requiring entire removal of the upper jaw, are seldom productive of lasting benefit. Our hopes should rather be directed to early diagnosis and the methods of operating I have here recommended.

(c) Unfortunately, many cases only present themselves when too advanced for any but palliative treatment. There are certain contra-indications which should make us refrain from interfering with the growths. They are—great extent of the growth, advanced age of the patient, and feeble general health. In inoperable cases the pain must be relieved by orthoform, cocaine, morphia or other opiates; the hæmorrhage must be kept in check by gauze plugs (*see also* Epistaxis, p. 110), and the nauseating smell must be controlled by antiseptics. However obstructed the nasal passages may become, and the patient consequently incommoded, we must beware of attempting to give temporary relief by partially clearing them. Such efforts only restore nasal respiration quite transiently, while the hæmorrhage started may be exceedingly difficult, if not impossible, to control. If an effort to clear the nasal air-way is indicated, it should be carried out as completely

* Denker, *Arch. f. Laryngol.*, Bd. xxi., Heft 1.

as possible. Ligature of the external carotid is of doubtful help in checking the progress of the growth, although it may be of assistance during operation.*

Inoperable sarcoma of the nose offers a suitable opportunity for trying the effect of injection by mixed toxins of erysipelas and *Bacillus prodigiosus* (Coley's fluid).† Radium may find in malignant growths in the nose a promising field of usefulness, and particularly in the case of sarcomata, where the relief of symptoms is sometimes remarkable.‡ The symptoms of inoperable growths, both in the nose and throat, may also be relieved by diathermy.§

* Chevalier Jackson, *Trans. Amer. Laryngol. Assoc.*, 1907.

† *Amer. Journ. Med. Sci.*, March, 1906; *Proc. Roy. Soc. Med.*, 1909.

‡ *Proc. Roy. Soc. Med.*, Laryngol. Section, vol. vii., Dec. 5, 1913, pp. 31-6.

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§ W. D. Harmer, *ibid.*

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CHAPTER XIII

NASAL POLYPUS

Synonyms.—*Mucous polypi*; *œdematous polypi*; *simple polypus of the nose*.

Etiology.—The causes of this common affection are not well established. Nasal polypi chiefly occur between the ages of 20 and 30, and are said to be more common in men than in women. They are very rarely found in the young. In 10,000 patients observed in ten years, only six cases were met with in children, the youngest being 6½.* The choanal or naso-antral polypus appears to be more common under 20 years of age, and is generally solitary (Brown Kelly); but ordinary ethmoidal polypi are frequently bilateral.

Frequency.—If looked for in the post-mortem room, nasal polypi will be found in one out of every eight or nine bodies examined (Zuckerkancl). In throat clinics they used to be met with once in every twenty patients (Morell Mackenzie).

Site of origin.—Mucous polypi never grow from the roof or floor of the nose, and rarely from the septum or inferior turbinal. They almost invariably arise from the outer wall, and principally from the margins of the middle meatus and the cells of the ethmoidal labyrinth. Hence they are found springing from the lip of the processus uncinatus, the lower and inner margin of the middle turbinal, the edges of the hiatus semilunaris, the infundibulum, and the bulla ethmoidalis (Fig. 111). But the ethmoidal labyrinth may be stuffed with masses of sessile polypi, weighing several ounces when removed, even when not a single polypus is visible in the nasal chamber (Figs. 118 and 119, pp. 242 and 244).

More rarely a polypus may take its origin in one of the accessory sinuses, and protrude through the natural ostium into the nose. This occurs most frequently in the maxillary sinus, and then the polypus generally passes backwards to hang into the postnasal space (*see* p. 343).

Histology.—A nasal polypus was formerly regarded as a typical example of a myxomatous tumour. More recently it was looked on

* Lacoarret, *Rev. Hebd. de Laryngol.*, xxii., ii., 1902, No. 37, p. 333.

as an œdematous fibroma. It is now generally agreed that a nasal polypus is not a new growth; it is an inflamed overgrowth of structures normal to the part in which it originates. Hence, according to its age and position, it may vary in structure from a simple œdema of the mucosa up to what may be regarded as an œdematous hypertrophy (Fig. 115, p. 235). Under the microscope, polypi are seen to consist of a loose fibrous stroma of which the meshes are filled with serous fluid. This fluid does not contain mucin, as was formerly held (Lack). The surface is covered with epithelium, columnar and ciliated in part,

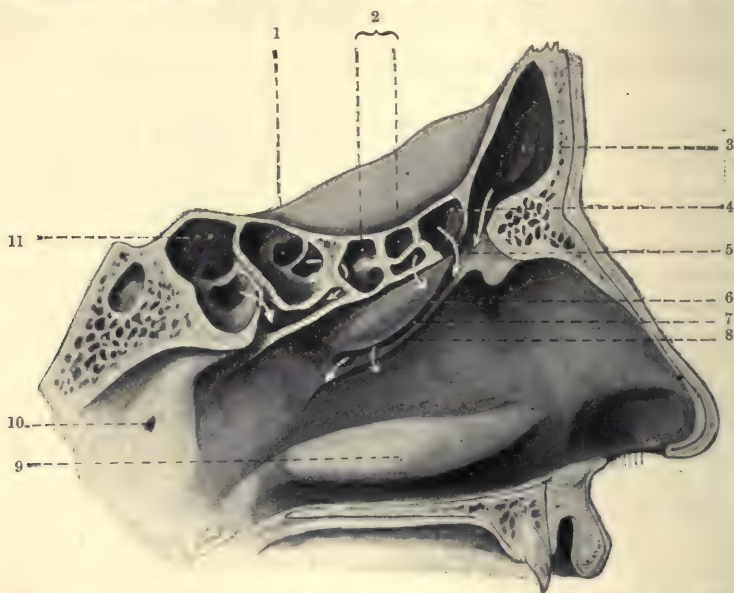


Fig. 111.—Anatomy of the outer wall of the left nasal chamber.

Sagittal section after the removal of the superior and middle turbinals. The frontal sinus opens, at its most dependent part, into the fronto-nasal duct which continues with the hiatus semilunaris. This gutter is bounded above by the bulge of the bulla ethmoidalis, and below by the ridge of the processus uncinatus. In the complete state it is overhung and concealed by the concavity of the middle turbinal. At its lower and posterior extremity two arrows indicate the normal ostium maxillare and an accessory ostium. One of the anterior or ethmoidal cells opens into the anterior extremity of the hiatus, below and exterior to the bulla. Another anterior ethmoidal cell opens into the middle meatus, above and interior to the bulla. The posterior ethmoidal cells open into the superior meatus (i.e. above the attachment of the middle turbinal), and the sphenoidal sinus opens into the speno-ethmoidal recess. Note how the anterior fossa of the skull, in the region of the crista galli, dips down towards the nose. This is the dangerous zone in intranasal operations. 1, Posterior ethmoidal cells; 2, anterior ethmoidal cells; 3, frontal sinus; 4, fronto-ethmoidal cell; 5, naso-frontal duct; 6, bulla ethmoidalis; 7, hiatus semilunaris; 8, processus uncinatus; 9, inferior turbinal; 10, Eustachian orifice; 11, sphenoidal sinus.

and in parts cubical; it may even be deficient. Glands, vessels, and nerves are found in the growth. The glands are especially numerous in the sessile and slower-growing polypi. They may become obstructed or pressed on by inflammatory exudation, and in this way are formed the cysts which are often met with, particularly in polypi growing far back. Scattered through the growth, and more marked in rapidly growing polypi, are masses of inflammatory round cells. Veins are

chiefly found at the bases of the polypi, and nerves are discovered with difficulty.

Pathology.—The pathological explanation of the origin of nasal polypi is uncertain. The various possible causes may be tabulated as follows :—

I. PHYSICAL CAUSES

A. Anatomical.

- (1) Abnormal narrowness of the nasal fossæ, obliging the patients to make repeated efforts at clearing them.
- (2) Abrupt bending of the vessels in the ethmoidal mucosa opposite spurs, predisposing to osteitis and œdema.
- (3) Spasmodic rhinorrhœa.

B. Irritative.

- (1) Foreign bodies.
- (2) Local traumatism.
- (3) Malignant growth.
- (4) Cerebro-spinal rhinorrhœa.

2. INFLAMMATORY CAUSES

A. Primarily attacking bone.

- (1) Necrosing ethmoiditis (E. Woakes).
- (2) Rarefying ethmoiditis (Lack,† Packard ‡).

B. Primarily attacking the mucosa.

- (1) Simple chronic catarrh.
- (2) Specific local infection.
- (3) Suppuration in the neighbourhood.

3. NERVOUS CAUSES

Spasmodic rhinorrhœa.

With regard to the above table, it may be mentioned that mucous polypi are not infrequently met with behind septal deviations and spurs; that they sometimes form around a foreign body or an osteoma; that the mere traumatism of removal, although perfectly successful at the time, may start a fresh group of polypi which subside spontaneously; and that I have seen them—slightly marked, it is true—on the one side of the nose affected with cerebro-spinal rhinorrhœa (p. 206).

But interest centres on the relationship of ethmoidal polypi to the underlying bone, and is divided between those who consider that disease originates in the bone and spreads outwards (Woakes, Lack, Packard), and others who regard the changes in the mucous membrane as primary, and the invasion of the bone as secondary (J. N. Mackenzie,§ J. Wright,|| Hajek ¶). Whichever view is held, there is

* Jacques, Soc. Franç. de Laryngol., 1903.

Jacques, *Rev. Hebd. de Laryngol.*, xxiv., Oct. 31, 1903, No. 44.

† *Proc. Laryngol. Soc., London*, 1902.

Clin. Journ., Oct. 21, 1903.

‡ Francis R. Packard, *Trans. Amer. Laryngol. Assoc.*, 1903.

§ *Journ. of Laryngol.*, Feb., 1897.

|| *N.Y. Med. Journ.*, Nov. 13, 1897.

¶ *Arch. f. Laryngol.*, Bd. iv., Heft 3.

the same necessity to remove all diseased ethmoidal cells, in order to effect a cure and prevent recurrence.

Nasal suppuration requires particular consideration as a cause of recurrent nasal polypi. Pus in the accessory sinuses, and particularly in the ethmoidal cells, is in my experience the cause of the recurrence in a large proportion of cases. Hence I incline to the view that pathological secretions of all kinds in the nose are the chief immediate cause of these inflammatory hypertrophies. Eugene S. Yonge suggests that polypus formation results from a chronic inflammation of the mucous membrane, dilatation of the glands within this area, and consequent œdema resulting from an increased pressure of the capillaries and increased permeability of their walls.*

Heredity may be a predisposing cause.

Symptoms.—The symptoms of nasal polypus develop slowly, and the patient sometimes becomes so gradually accustomed to his condition that the disease is often well marked when a case first presents itself. The symptoms are those of nasal obstruction and its consequences (p. 92). The obstruction is generally more marked in cold, damp weather, and diminishes when it is dry and warm. It may be complete, and the growths may even appear at the anterior nares. The discharge is generally watery, and although not abundant is apt to be constant, as if the patient had a "chronic cold." There is often complete loss of smell, and the voice assumes a nasal tone.

A condition of postnasal catarrh and pharyngitis frequently forms part of the symptoms, as well as epiphora, Eustachian catarrh, and headache. The feeling of mental hebetude and general malaise induced is frequently extreme, although so insidious in its onset, owing to the slow development of the neoplasms, that a patient often only realizes the cause of his depression when the nasal respiration is restored.

The various reflex symptoms which may be induced need not be enumerated. The most frequent are emphysema and asthma; others are described on p. 192.

Examination.—Soft as polypi are individually, they are sometimes packed so tightly in the cavities of the nose that the bridge is widely distended, and the nasal bones can be felt beneath the skin to be separated from one another (Fig. 112). This broadening of the nose generally subsides after the operation, but in some cases it persists.

An inspection of the nasal cavity will show it to be more or less completely obstructed by the polypi. Their gelatinous appearance has been compared to that of an oyster, or to the pulp of a grape. So translucent is it at times that it is apt to be mistaken for a mass of mucus if the nasal probe is not employed. In cases

* "Polypus of the Nose," p. 174. London, 1906.

of some standing, the anterior part of a large polypus, if exposed to dust and irritation, may assume a pink or even dark-red colour. In neglected instances the polypus may become white and opaque, like a piece of macerated flesh. The exact situation will be better defined by using a little cocaine, when the polypi will be found



Fig. 112.—Nasal polypi.

Shows the nasal disfigurement and mouth-breathing which may result.

occupying the middle meatus, from which they descend under cover of the middle turbinal, and over the surface of the inferior. (Figs. 118 and 119, pp. 242 and 244.) They are rarely seen in the olfactory cleft. With the probe these gelatinous masses are found to be mobile, and when one is raised another is generally discovered hidden behind it. The larger the polypus the more movable is it, and the smaller is found to be its pedicle. Quite small ones may be attached by a broad base. The smaller the

polypi the more numerous they are. The size is very variable, and may be anything from a growth the size of a pin's head to a neoplasm measuring 5 inches long by $1\frac{1}{2}$ inches across at its widest.* A large one may weigh 28 grm. (1 oz.).† A solitary polypus is rare, and as many as 120 have been counted from a single nose. The shape of a polypus is also subject to great variation, but as there is nearly always a marked pedicle their form is generally suggestive of an inverted flask or cock's comb.

In addition to the solitary or choanal polypus which presents in the postnasal space, large polypoid masses may descend into the pharynx and appear below the soft palate (Plate 1., Frontispiece, Fig. 1).

The condition of the accessory sinuses must be carefully examined, not forgetting that in cases of choanal polypus the affected maxillary sinus may be quite clear on transillumination.

Diagnosis.—It is seldom that the diagnosis of nasal polypi presents much difficulty, yet the mistakes made are probably more frequent than in any other of the ordinary affections of the nose, and are only equalled by the frequency with which polypi are overlooked. The latter oversight is in most cases due to the neglect of the use of cocaine in making a complete exploration of the nose, and the former is generally attributable to the omission to make use of the nasal probe. The probe should at once settle any question as to deviations, spurs, or turbinal hypertrophies—which are most commonly mistaken for polypus. These hypertrophies are always somewhat fleshy, and attached by a broad base, and their gradual fusion with normal tissue can be traced. Besides, although they are not uncommon on the anterior extremity of the middle turbinal, they are most commonly met with on the extremities and along the lower margin of the inferior turbinal—situations where mucous polypi are rarely found. (Cf. Figs. 72 and 73, p. 132.)

Papillomata are hard and irregular, instead of being smooth, round, and soft; fibromata are firm and fleshy-red, but are so rare in the front of the nose as seldom to require consideration. The question of malignant growth is one that more frequently comes up for consideration, especially as a malignant tumour may sometimes be concealed by polypoid outgrowth. Malignant polypi grow rapidly, ulcerate early, and bleed spontaneously; the opposite conditions exist with mucous polypi. Malignant growths are firm, slightly movable, and bleed easily if touched. The probe shows that a nasal polypus is soft, movable, and seldom bleeds even when freely moved. A meningocele might be mistaken for a nasal polypus.‡

Prognosis.—In some cases this should be reserved, not only because of the inveterate character of nasal polypi, but because we cannot tell whether the progress of treatment will reveal a

* Jonathan Wright, "American Textbook of Diseases of the Eye, Ear, Nose, and Throat," ii, p. 1078. 1899.

† Grünwald, "Atlas and Epitome of Diseases of the Mouth, Pharynx, and Nose," p. 86. London, 1903.

‡ Grünwald, "Nasal Suppuration," p. 319. London.

sinusitis, or some hidden growth. To some extent a rash prognosis is avoided by making a thorough examination at the first visit and searching for suppuration, deviated septum, turbinal hypertrophy (anterior or posterior), or adenoid growths, any of which would entail longer treatment. The wisest plan is to promise the patient nothing more at first than the restoration of nasal respiration, although he can be told that with patience and perseverance most cases are radically cured.

Treatment.—There are no topical medicinal measures which

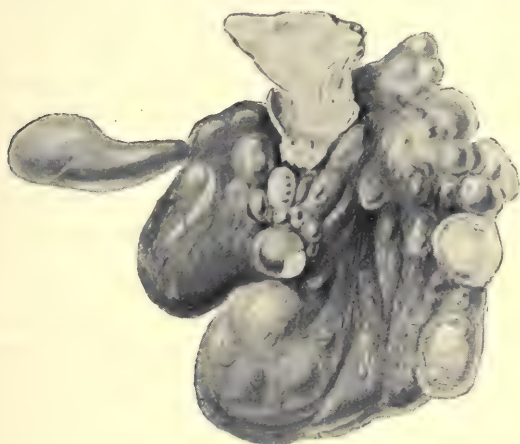


Fig. 113.—Ethmoiditis.

Life-size drawing of a fresh specimen of polypoid and cystic hypertrophy, with the portion of rarefied bone from which it grew.

can do more than relieve the catarrh of nasal polypi. The old-fashioned method of treating polypi consisted in the introduction of a pair of polypus-forceps into the nose, opening them as widely as possible, closing them firmly on everything which fell within their grasp, and then twisting away whatever this happened to be. It need hardly be remarked that healthy tissue was frequently extracted, hæmorrhage was often alarming, and while the attachment of the polypi escaped, adhesions and other drawbacks were left as a legacy.

In operating on nasal polypus, two facts should be kept in mind. The first is that, with few exceptions, nasal polypi spring from under cover of the middle turbinal and the neighbourhood of the middle meatus; the second is that, when numerous, rapidly recurrent, or associated with suppuration, they will be found to be dependent on pus in one or more of the accessory sinuses.

Removal with the snare.—If only a few polypi are present, and no sinus suppuration is suspected, they can be satisfactorily operated on with the cold-wire snare. The surgeon will employ the pattern of snare to which he is accustomed. The simpler models, such as those of Krause (Fig. 79, p. 138) or some form of Blake's, are threaded with No. 5 piano-wire, and the loop arranged so as to be just large enough to embrace the growth. The nose is carefully prepared with cocaine and adrenalin (p. 75), remembering that the polypus itself is insensitive, and that the anterior part of the nasal cavity, and particularly the septum, should be thoroughly anæsthetized. Under good illumination the snare is introduced with the loop vertical, and passed alongside the polypus—between it and the septum—or to the outer side, as space permits. It is then swept round a half-circle, so as to bring the growth within the loop, and by a to-and-fro movement the snare is worked upwards and outwards towards the usual attachment of the polypus in the region of the middle meatus. The wire loop is thus threaded on to the polypus. The loop is now steadily tightened until it is felt that the pedicle is grasped—it is seldom visible. By a quick movement of avulsion the polypus is then torn from its attachment. This will bring away some of the œdematous tissue on the distal side of the loop, and there will be less tendency to recurrence than if the root is simply cut across. With the removal of the first polypus others come into view, and they must be treated in the same manner. The number which can be removed at one sitting will depend on how well the patient is able to bear the manipulations, and how much bleeding there is. If both nostrils are affected, it is well to treat them in alternate weeks.

When the polypus slips or is pushed backwards, it can be brought forward into the field of operation by asking the patient to blow down the nose with the opposite nostril closed. Or the presenting part of the polypus may be seized with a pair of toothed catch forceps, and the wire loop slipped over this.

If the polypus is growing backwards, and presents in the post-nasal space, as it often does when it originates from the mucosa of the maxillary antrum, it may be necessary for the operator to introduce his left forefinger behind the palate, as described at p. 136 (cf. Fig. 79), so as to steady the growth and at the same time slip the wire loop around it. If there is no space for the latter manipulation, the left forefinger is used to steady the polypus while a pair of polypus forceps is guided along the floor of the nose until the growth can be seized between the blades so as to tear it from the attachment and pull it out through the anterior nares.

After-treatment.—The bleeding will generally cease spontaneously, assisted by cold ablutions to the face, or pinching the end of the nose until a clot forms (*see* p. 84). If bleeding persists, a piece of gauze, moistened with peroxide of hydrogen, should be packed in lightly, and removed as soon as the patient can lie down quietly. It is best to avoid the use of any plug. It was to plugging that Luc attributed the loss of a patient from meningitis consequent on the removal of a polypus.*

If the entrance to the nose is tender it may be smeared with a little menthol and boric ointment, ice-cold cloths may be kept across the bridge of the nose, and pain or sensitiveness can be relieved by a few doses of phenacetin or similar antineuralgic.

Insufflations of antiseptic powders are useless, and the nasal cavity should be left alone for twenty-four or forty-eight hours. A nose lotion should then be used two or three times a day, until the local condition is again inspected at the end of a week.

Any attempt to destroy the roots of the polypi by the galvanocautery is useless and dangerous.

Removal of polypi with forceps in ethmoiditis.†—It is now recognized that the "recurrence" of nasal polypi is generally accounted for by the frequent failure to detect disease in the underlying ethmoid bone, and suppuration in the neighbouring accessory cavities. Both of these causative factors must, therefore, be removed.

To remove the diseased ethmoid, together with its attached polypi, the nose is prepared with adrenalin and cocaine, the strips of moistened ribbon gauze being carefully tucked in between the septum and the ethmoidal region, as well as between this latter and the outer wall. The inferior turbinal and the front of the nasal cavity should be similarly prepared, so as to diminish vascularity, retract the healthy tissue, and thus increase the space for operating in, while lessening the risk of wounding the septum and so causing adhesions. At least one hour should be given for the solution to act. The operation is carried out while the patient is sitting upright in the ordinary examination-chair, with the body craned forward somewhat, and the head supported by a rest or held in focus by an assistant. Ready to the surgeon's hand should be some lengths, about a yard, of ribbon gauze (1 inch to 2 inches wide), and a vessel of cold sterilized water into which it is easy to shake off the growths as they are removed with the forceps.

If necessary, the middle turbinal can be amputated as described at p. 135. In many cases of ethmoidal caries it is easily removed with nasal forceps. But, as it is not always diseased, it is better to preserve the middle turbinal, simply dislocating it inwards towards the septum so as to obtain access to the ethmoidal labyrinth. The

* *Rev. Hebdomadaire de Laryngologie*, xxiv., Nov. 14, 1903, No. 46, p. 597.

† L. Hajek, *Journ. of Laryngology*, xxviii., 1913, No. 1, p. 35.

H. L. Lack, *ibid.*, No. 3, p. 148.

turbinal, thus preserved, acts as a useful anatomical guide, for it helps us to avoid the exceedingly dangerous area of the olfactory cleft and the cribriform plate, which lies in the district between it and the septum. (Fig. 119, p. 244.)

The instrument I recommend is Luc's forceps* (Fig. 114), supplemented by Grünwald's punch-forceps (Fig. 78, p. 137) and a sharp spoon. The former are introduced vertically, so that one blade passes between the ethmoid and the septum, and the other passes upwards under cover of the middle turbinal. By insinuating them carefully, and gradually working them upwards and outwards, a large mass of polypoid tissue and carious ethmoid can be grasped, twisted off, and shaken from the forceps into the vessel of water (Fig. 113, p. 231). Before any marked flow of blood has taken place, it will be possible to make a second or third introduction of the forceps, and seize the successive masses of polypi which come into view. When the bleeding obscures the field of operation, one of the strips of gauze can be picked up quickly in the forceps and used for plugging that

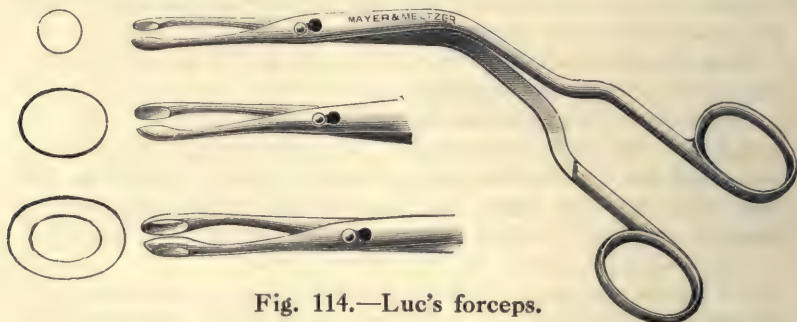


Fig. 114.—Luc's forceps.

side of the nose, while a similar operation is carried out in the opposite nasal chamber if it is affected.

Hæmorrhage may require the plug to be left in place for a few minutes, so as to get a clear view of the depths of the nose. This is better secured if the ends of the gauze strips are first soaked in either adrenalin or a 5 per cent. solution of hydrogen peroxide. In this way the main mass of the ethmoid can be completely cleared away, the posterior ethmoidal cells opened up, and the front wall of the sphenoidal sinus broken down. Not infrequently the surgeon finds afterwards that this latter cavity has been inadvertently, though successfully, opened.

Under a general anæsthetic this operation can be even more satisfactorily carried out, but the surgeon has to keep well in mind the anatomical relations of the parts, and the altered relationship to the horizontal position compared to what he is more accustomed to with the patient sitting in the examination-chair. When chloroform is employed, the interior of the nose is prepared in the same way beforehand with adrenalin and cocaine (p. 75); the patient is placed horizontal on an operating table, with his head and shoulders slightly raised; the postnasal space is plugged with sponges (p. 85); and the tongue

* *La Tribune Méd.*, 1905.

s drawn forward with a clip (Fig. 206, p. 394), so that the administration of the anæsthetic through the mouth is quite uninterrupted. This method allows the surgeon to operate deliberately, generally with the hæmorrhage under easy control, the field of operation well illuminated, and with no disturbance in regard to the anæsthetic. It also permits the introduction of the operator's little finger to some distance, so as to detect polypoid or carious surfaces.

The removal of the diseased ethmoid can then be completely carried out. In a case in which both nostrils were stuffed with polypi, I removed at one sitting a mass of diseased ethmoid which weighed 4 ounces.*



Fig. 115.—Nasal polypi.

Life-size drawing of polypus removed through the mouth from the naso-pharynx, and growing from the right ethmoid. The pedunculated polyp projected below the soft palate, as shown in the Frontispiece. The thicker mass was also removed per os from the naso-pharynx.

The anterior ethmoidal, or agger nasi, cells can be cleared with a curette, as described on p. 279; and the same instrument is useful, after the chief masses of polypi have been extracted, for opening diseased posterior ethmoidal cells or a suppurating sphenoidal sinus. (Cf. Figs. 147 and 150, pp. 279 and 282.)

When the operation is completed the postnasal plug is removed, and the forefinger of the left hand should be passed well up into the

* *Proc. Laryngol. Soc., London*, xiv., 1907, p. 106.

posterior choana to detect and push forwards any masses of growth which may have been driven backwards.

Hæmorrhage generally ceases with the usual remedies (p. 83). It is better to avoid plugs.

After-treatment.—(See p. 90.) A little ointment (Formula 74, p. 813) may be smeared in and around the nostrils, but the nasal cavity should be left alone for the first three or four days, until reaction and swelling have subsided. It can then be cleansed with a simple nasal wash (Formulæ 8 to 11, p. 801). When the nose begins to clear, semi-detached tags of polypoid tissue, or spicules of bone, may require removal. The surgeon is sometimes disappointed to note what appear to be masses of recurrent polypi, but in many instances these are simply composed of œdematous mucosa, and subside as soon as reaction has passed.

Results.—In cases where there is no suppuration in the adjoining sinuses, a cure is often effected at one operation. Even if a few polypi or some suppurating ethmoid cells are found afterwards to have escaped removal, they are easily dealt with under cocaine. If there is sinus suppuration it can now be more readily treated, and a cure can be promised on its cessation.

Dangers and complications.—This operation in careless or inexperienced hands is not free from risks. The chief danger is from injury to the cribriform plate, as any damage in this area, occurring in the septic conditions which usually call for operation, is generally followed by fatal meningitis.* Sometimes an autopsy fails to show any lesion in the nose by which infection gained the meninges, and it can only be supposed in such cases that it passed by the sheaths of the olfactory nerve.†

In addition to the usual precautions, particular care should be exercised while manœuvring in the anterior part of the space between the septum and the outer nasal wall. Here the punch-forceps are not directed backwards against the main mass of the sphenoid, but—as the head has to be extended in order to approach the anterior area—they follow an obliquely upward direction that brings them into anxious proximity with the floor of the cranial fossa, which dips down lower in front than it does posteriorly (Fig. III). Great care, therefore, must be taken to avoid any thrusting or boring movements with the forceps. They are first employed to press outwards as much as possible the opposing walls of this narrow region, so that polypoid masses can fall between the blades under good inspection. Occasionally the os

* "Il ne faut pas oublier que le nombre des cas de mort par méningite ou infection consécutives à des manœuvres chirurgicales pratiquées par le nez sur les cellules ethmoïdales est beaucoup trop considérable (sans compter les cas malheureux qui n'ont pas été publiés) pour ne pas rendre prudent le chirurgien qui s'aventure dans cette zone des fosses nasales, la plus dangereuse peut-être, au point de vue chirurgical, pour une main inexpérimentée ou malhabile."—E. J. Moure, *Revue Heb. de Laryngol.*, xviii., 5 Mars, 1898, No. 10, p. 273.

† Hinsberg, *Ann. des Mal. de l'Oreille*, xxxix., 1913, No. 11, p. 490.

planum is perforated, and the condition is revealed by emphysema of the eyelids, or an ecchymosis like a "black eye." An orbital abscess may follow (Lack).

Indications.—This operation is indicated in cases of recurring polypi, and extensive caries of the ethmoid. It is a most necessary proceeding in securing radical cure of multisinusitis (p. 306).

Contra-indications.—If there are any cerebral symptoms, suggesting that intracranial extension of infection has already taken place, the patient should be carefully examined before the operation is embarked on. It is unsuitable for the debilitated and the elderly. In patients over 50 it is sometimes wiser to attempt relief by a series of small operations under cocaine.

Removal through an external wound.—The anterior ethmoidal cells can be well treated through the incision required for a radical frontal sinus operation (p. 283).

Recurrence.—Marked tendency to recurrence should direct attention to the frontal and maxillary sinuses. If associated with hæmorrhage, the possibility of malignancy must be kept in mind.

PART III.—DISEASES OF THE ACCESSORY SINUSES

CHAPTER XIV

INFLAMMATION IN THE ACCESSORY SINUSES OF THE NOSE

THE study of acute and chronic inflammation in these cavities deserves careful consideration for the following reasons:—

1. It may reveal the true source of many cases of nasal and postnasal catarrh.
2. Distant and sometimes obscure symptoms may be traced to sinus suppuration.
3. The symptoms are frequently not characteristic.
4. There is often some associated affection in the nasal chambers.
5. Several sinuses may be affected simultaneously.
6. Evidence of sinus suppuration, or of its localization, in some cases, can only be arrived at indirectly.
7. The prognosis has to be very carefully considered.
8. The indications for treatment vary considerably in different cases, and according to the sinus affected; hence
9. The importance of a complete diagnosis of all the sources of pus in the nose.
10. The affection tends in certain cases, as yet not well determined, to fatal sequelæ.
11. The detection and cure of the condition is sometimes an easy proceeding, and well within the powers of any practitioner.
12. In certain cases the diagnosis is difficult, and the treatment, which requires considerable study and skill, is not devoid of danger.

Other than inflammatory affections of the sinuses occur more rarely, and require shorter notice. Certain features of any sinus suppuration are common to all the cavities, and can therefore be studied together; but each sinus requires individual consideration owing to (*a*) its shape, (*b*) the situation of its orifice, and (*c*) its relation to neighbouring organs. The anatomical data are of great importance.



Anterior skiagram of the head, to show normal outlines of healthy sinuses. (*Finci.*)

(In this case the negative X-ray findings were confirmed by exploratory lavage of the maxillary and sphenoidal sinuses.)

SURGICAL ANATOMY OF THE ACCESSORY SINUSES

From both anatomical and clinical considerations it is convenient to divide the accessory sinuses into two groups, according as to whether their ostia open (*a*) *anteriorly* into the middle meatus, below the attachment of the middle turbinal, or (*b*) *posteriorly* into the superior meatus, and above the middle turbinal. Thus :—

ANTERIOR GROUP

Maxillary sinus.

Frontal sinus.

Anterior ethmoidal cells.

POSTERIOR GROUP

Posterior ethmoidal cells.

Sphenoidal sinus.

The **maxillary sinus**, or antrum of Highmore, has often been compared in shape to a three-sided pyramid (Fig. 116). The temporal or posterior wall, formed by the body of the superior maxilla, is very thick. The thin orbital wall forms the roof of the sinus. The anterior wall corresponds to the facial surface of the superior maxilla, and over the canine fossa it may only measure 2 mm. in thickness. The base of the pyramid corresponds to the outer wall of the nasal fossa, which is naturally convex towards the sinus. The central area of this base is very thin, and in certain parts is closed only by membrane (Fig. 117). Advantage is taken of this in exploratory puncture of the sinus (p. 258). The

natural opening of the sinus is found on this wall, but nearer to the roof than to the floor of the cavity. It opens into the middle meatus by the ostium maxillare, at the posterior extremity of the hiatus

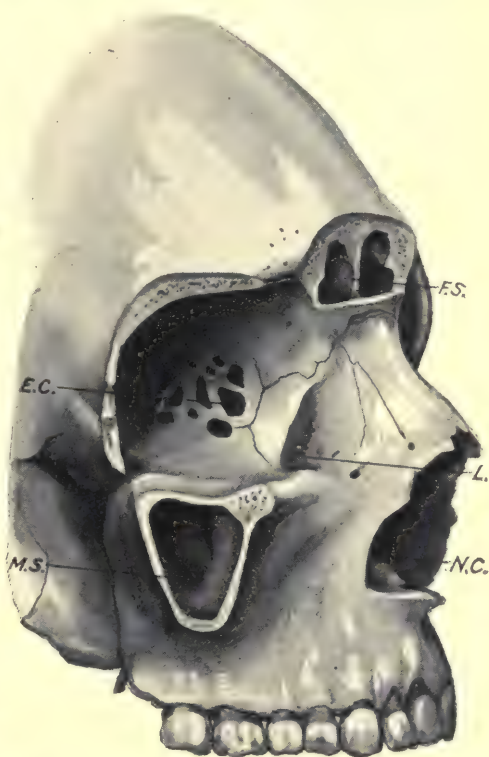


Fig. 116.—Preparation of a skull, viewed from the right side.

The drawing illustrates the relation of the orbit to the nasal cavity and the accessory sinuses. Portions of the upper and outer orbital walls have been removed in order to expose the greater part of the ethmoidal cells, which chiefly form the inner wall of the orbit. The cells are opened, but their dividing septa have been preserved. The maxillary sinus (antrum of Highmore) and the cavities in the frontal bone have been opened. The situation of the mouth of the maxillary sinus is well shown at the upper part of the cavity. (Adapted from Onodi's "Atlas of Nasal Anatomy," translated by StClair Thomson. London, 1895.)

semilunaris. One or more accessory openings are sometimes met with, also in the middle meatus, generally posteriorly to the ostium (Fig. 111). The junction of the base and the anterior wall forms what is frequently referred to as the floor of the sinus. It is really a rounded angle, lying above the alveolar border of the superior maxilla. The roots of the teeth, particularly the second bicuspid and first molar, are only separated from the cavity by a thin lamella of bone (see Fig. 117). The muco-periosteum is frequently arranged in folds or ridges. The floor of the maxillary sinus and that of the nose may be on the same horizontal plane, but that of the sinus is generally about half an inch lower.*

A large adult maxillary sinus will hold 1 ounce of fluid,† but the cavity may be represented by a mere chink, or, more rarely, be entirely absent.‡ The two antra need not be symmetrical.

Development.—The maxillary sinus exists at birth in a rudimentary form, and reaches in the fifteenth to eighteenth year a form which approximates to the adult type (Warren B. Davis).

Frontal sinus.—The following anatomical points are worth recalling: The cavity is smaller in young people, and in women than in men. There is no necessary relation between a prominent superciliary ridge and a capacious frontal sinus. The posterior wall is thin and brittle. The floor of the cavity overlies the roof of the nose and the orbit. The cavities are very irregular and unsymmetrical, and are separated by a septum which is seldom in the middle line except at its base. The ostium lies at the most dependent part of the cavity; it leads into the fronto-nasal duct, which opens into the anterior end of the hiatus semilunaris. The sinus may be completely absent on one or both sides (Plate ix.; facing p. 282).

Development.—The frontal sinus is absent at birth; it develops from the anterior ethmoidal area. The distinct beginning is demonstrable during the first year of life, and by the third year it is above the level of the nasion.§ The sinus is seldom evident before the seventh or eighth year, and reaches complete development between the fifteenth and twentieth year.

The **ethmoid cells** have important relations, lying close to the orbit (Fig. 117), the cranium, and the ostia of the larger accessory cavities. The cells increase in size from above downwards, and from before backwards. They are divided into two groups, an anterior and a posterior. The anterior open into the upper part of the hiatus semilunaris by one or more openings, and therefore pour their secretions into the middle meatus and close to the mouths of the frontal and maxillary sinuses. The ostia of the posterior group are situated above the middle turbinal, and therefore open into the superior meatus of the nose and close to the mouth of the sphenoidal sinus (Fig. 111, p. 226).

Development.—As a rule the ethmoidal labyrinth is not apparent in infant skulls. It generally develops about the age of 4 or 5 years, and is not fully developed until about the twentieth year.

* A. S. Underwood, *Journ. of Laryngol.*, xxiii., Nov., 1908, p. 620.

† W. A. N. Cattlin, *Trans. Odont. Soc., London*, xcix., 1857, p. 31.

‡ Morgagni, "De Sedibus et Causis Morborum." 1779.

§ Warren B. Davis, "Development and Anatomy of the Nasal Accessory Sinuses." Philadelphia and London, 1914.

The **sphenoidal sinuses** are separated from one another by a septum which is seldom quite vertical. They are not often symmetrical. The orifice of the cavity is situated in the anterior wall, a few millimetres below the roof of the nasal cavity, and therefore communicates

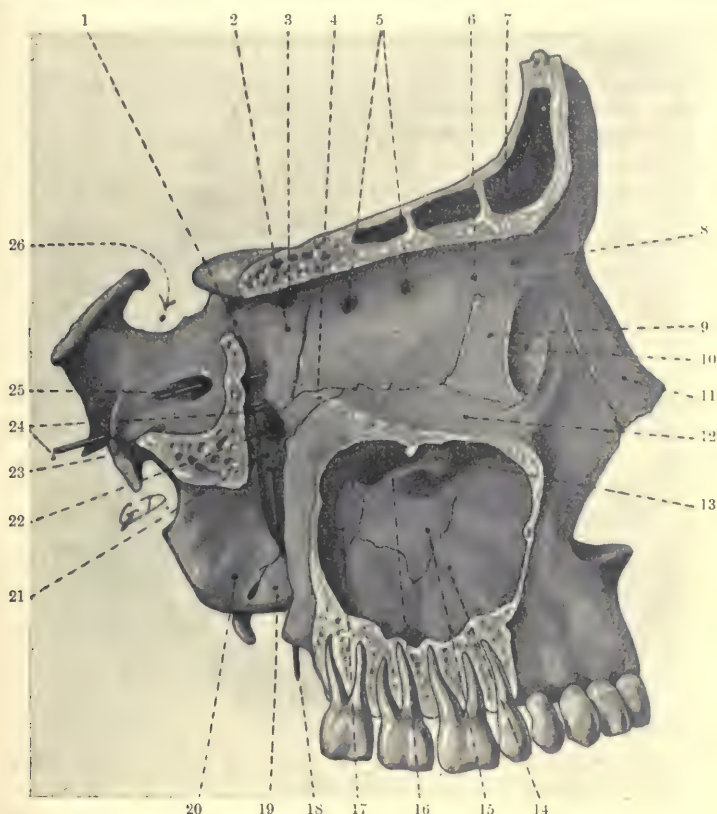


Fig. 117.—Surgical anatomy of the maxillary sinus.

The maxillary sinus has been opened from the outside to show the anatomy of the inner nasal wall. The relations of the orbit to the antrum and to the frontal sinus are readily seen. The relations of the roots of the teeth to the maxillary sinus are well shown. The first and second molars are generally in close connexion with the cavity, into which their roots project, covered with a thin lamella of bone. 1, Sphenoidal fissure; 2, body of the sphenoid; 3, optic foramen; 4, orbital process of palate bone; 5, ethmoidal canals; 6, orbital plate of frontal bone; 7, frontal sinus; 8, trochlear fossa; 9, lachrymal bone; 10, lachrymal fossa; 11, nasal bone; 12, orbital surface of superior maxilla; 13, unciform process of the ethmoid; 14, nasal wall of the maxillary sinus; 15, maxillary process of the inferior turbinal; 16, ethmoidal process of the inferior turbinal; 17, perpendicular plate of the palate bone; 18, probe in palatine canal; 19, pterygoid process of the palate bone; 20, external pterygoid plate; 21, pterygo-palatine fossa; 22, sphenopalatine foramen; 23, 24, probe in pterygoid canal; 25, foramen rotundum; 26, sella turcica. (After Spalteholz.)

through the sphenop-ethmoidal recess with the superior meatus of the nose (Fig. 111, and Fig. 163, p. 301).

Development.—The extent of development of the sphenoidal sinus during childhood has evidently been underestimated. Thus it is said

to be not present at birth, and its appearance is given by different authors at the third (Steiner), seventh (Laurent), or twentieth year (Tillaux). But in a 65-day embryo the first indication of this cavity can be noted by an invagination of the mucosa from the recessus sphenothmoidalis: the cavity is distinct in a child 8 days old; and although growth during childhood is slow, yet in a child of 6 it is a good-sized cavity.

The **mucous lining** of the accessory sinuses consists of thin, closely adherent, ciliated epithelium.

Physiology of the accessory sinuses.—Little is positively known as to the function of these cavities. They have been regarded as resonating spaces for the voice; as serving for the secretion of mucus;



Fig. 118.—Coronal section in the anterior third of the nose, viewed from the front.

Shows the inferior and middle turbinates: polypi growing from the ethmoidal region on each side, and polypoid degeneration of the lining of the left maxillary sinus. A probe is passed up into the frontal sinus on the left side.

as assisting in directing the inspired air towards the olfactory region; as vestigial accessory organs of smell; or as helping to diminish the weight of the bony cranium.

SINUS SUPPURATION

Etiology.—Suppuration may arise primarily from direct infection of the sinus, or secondarily to some intranasal affection. Among the acute infectious diseases which give rise to sinusitis are influenza, pneumonia, enteric, measles, scarlatina,* smallpox,

* G. Killian, *Zeit. f. Ohrenheilk.*, Bd. lvi., Heft 3; and *Ann. des Mal. de l'Oreille*, xxxvi., 1911, No. 1, p. 59.

cerebro-spinal meningitis, diphtheria, erysipelas, and, more rarely, glanders, mumps, and gonorrhœa. Coryza, and all processes in the nose associated with pus formation, may induce empyema in the accessory cavities. Predisposing causes have been found in acute rheumatism, peritonitis, contracted kidney, mercurial ptyalism, phosphorus-poisoning, and plumbism. The use of the galvano-cautery in the nose, nasal douches, and plugs, the presence of flies and larvæ and even of vomited matter (Harke), diving into water feet-foremost (Luc), and infection from swimming-baths,* have also been productive of sinus suppuration.

External violence, e.g. falls or blows on the fronto-ethmoidal region, will sometimes set up a sinusitis, which may prove fatal from cerebral complications.† The suppuration may be maintained or aggravated by the presence of a foreign body, as when a plug or a drainage-tube has accidentally slipped into the maxillary sinus through an alveolar drainage opening, or portions of gauze or cotton-wool are left in it. The greater frequency with which the maxillary sinus is affected is due to the fact that, in addition to the aforementioned causes, it is exposed to infection arising from the teeth, either by the eruption of a root abscess into the cavity, or by a tooth-stump being driven into it during an extraction. Clinical and bacteriological investigations agree in showing that from 10‡ to 33 per cent. of the cases of antral suppuration are due to dental infection§ (cf. Figs. 126 and 127, p. 257).

The presence of nasal polypi, occluding the natural ostia, is often considered a cause of empyema; but the marked manner in which polypi cease to form when the diseased cavities are drained compels us to view them as usually the result rather than the cause of sinusitis. The predisposing effect of nasal stenosis is shown by the greater frequency with which unilateral empyema is found on the side of the narrow nostril.

A malignant growth, or syphilis, in an accessory cavity will give rise to suppuration. Finally, pus from one cavity may infect another.

Most of the chronic suppurations in the sinuses result from acute attacks.

Bacteriology.—Inflammation of the sinuses is caused by bacteria, except in a few cases (aspergilli and vermes, *see* pp. 188,

* G. Wilkinson, *Proc. Roy. Soc. Med.*, Laryngol. Section, Dec. 1, 1911, p. 51; and *Journ. of Laryngol.*, xxviii., 1913, No. 4, p. 222.

C. W. M. Hope, *Proc. Roy. Soc. Med.*, Laryngol. Section, vii., March 6, 1914, p. 114.

† J. A. Stucky, *Ann. of Otol., Rhinol., and Laryngol.*, xvi., June, 1907, No. 2 p. 364.

‡ Joseph P. Tunis, *Laryngoscope*, Oct., 1910.

§ A. Logan Turner and C. J. Lewis, *Edin. Med. Journ.*, April, 1910.

310). The bacteria found are those that are commonly present in the buccal and nasal cavities; in the former in health, in the latter occasionally in health and usually in disease. An enumeration of the results of various bacterioscopic examinations of empyemata does not materially advance the subject.* More interesting are the researches of Stanculeanu and Baup, who found that the organisms of sinus suppuration might be divided into two groups: (1) those of nasal origin—such usual organisms as



Fig. 119.—Coronal section about the centre of the nose, viewed from the back.

The section shows the inferior, middle, and superior turbinals; and the maxillary, ethmoidal, and frontal sinuses. The relation of the ethmoidal cells to the frontal sinus, and of both to the orbit and cranium, are well shown. Polypi are seen in the middle meatus on each side, growing from the ethmoid region; and there is polypoid degeneration of the mucous membrane of the maxillary sinus on the left side. A probe is passed through the left ostium maxillare. (Author's specimen.)

pneumococci, streptococci, and staphylococci—were chiefly aerobic, and the pus was not fetid; (2) those of dental origin were mainly anaerobic, were due to dental disease, and produced a fetid pus. In two cases the fetor was attributable in part to the *Bacterium coli*.† I have found the *Micrococcus catarrhalis*, the pneumo-

* E. Fraenkel, *Virchow's Arch.*, Bd. cxliii., 1896.

Weichselbaum, *Wien. med. Woch.*, 1890, p. 223; 1893, pp. 32 and 33.

W. T. Howard, jun., and J. M. Ingersoll, *Amer. Journ. Med. Sci.*, May, 1898.

† *Arch. Internat. de Laryngol.*, xiii., 1900, No. 3, p. 177.

coccus, or the *Bacillus influenzae* in pure culture in cases of acute sinusitis.*

Morbid anatomy.—The changes in the mucous membrane are essentially of a chronic inflammatory character, leading to round-celled and serous infiltration, and followed by polypoid and cystic degeneration, periostitis, rarefying osteitis, and caries. Caries is uncommon and necrosis (except in syphilitic cases) is very rare.†

ACUTE INFLAMMATION AND SUPPURATION

Etiology.—This forms a part of many acute catarrhs which invade the sinuses by direct extension from a nasal coryza. Acute exacerbations are not uncommon in the course of chronic empyemata. They are generally met with in adults, and occur more rarely in children under 15.

Symptoms.—Acute sinusitis may be (a) of a mild type, so that there is only slight oppression or heaviness over the affected cavity, with a discharge which passes unperceived, or (b) of a severe form with external symptoms which often escape correct diagnosis (Fig. 124, p. 253).

Acute sinusitis so frequently forms a part of acute nasal coryza that many of the symptoms are very similar. Those which point to the implication of a sinus during an acute "cold in the head" are (1) pain in the region of the cavity, generally described as neuralgia, and (2) tenderness on pressure. Lachrymation, photophobia, œdema or slight congestion of the eyelids, proptosis, and deep-seated headache also suggest the implication of a sinus. Of course, more than one cavity may be affected at the same time. The occurrence of a rigor or a rise of temperature would indicate more than a simple catarrh.

Relief is obtained by a discharge of mucus, which may be bright yellow and blood-stained or muco-purulent, or by a free gush of pus, sometimes very offensive both to smell and taste.

Examination may reveal the usual evidences of acute rhinitis. If the anterior group of sinuses is affected (p. 239) the middle turbinal will be congested, infiltrated, and pushed against the septum, while the meatus below it will be clogged with stringy mucus, and later on with muco-pus, or pus. Transillumination may direct attention to the maxillary sinus; and a puffiness of the forehead, or a fullness and duskiness of the eyelids on one side, will point to the frontal or the ethmoidal cavities. When the posterior group is affected the rhinoscopic mirror will show a

* *Practitioner*, Jan., 1907, p. 42.

† J. S. Fraser, "The Histology of Nasal Accessory Sinus Suppuration," *Journ. of Laryngol.*, xxiv., 1909, No. 9, p. 473.

deeply congested and velvety appearance of the fornix and anterior sphenoidal wall, and muco-pus will ultimately be visible above the superior turbinal or on the posterior pharyngeal wall.

Diagnosis.—The occurrence of facial neuralgia, with a discharge of pus from the nose, should always suggest a sinusitis. If the purulent flow is unilateral it adds to the probability. Since many of the patients with acute sinusitis are seen in bed, the discharge may all flow backwards and only be visible in the pharynx. In the early stage there may be no pus in the nose, and in some cases



Fig. 120.—Coronal section of the posterior third of the nose, viewed from the front.

The section shows the inferior, middle, and superior turbinates. There is a polypoid, mulberry hypertrophy of the posterior end of the right inferior turbinal. A very small portion of the maxillary antrum is seen on each side. The relations of the frontal sinuses and ethmoidal cells to one another, and to the orbit and cranium, are well seen. The specimen shows the roof of the posterior choana, the front wall of the sphenoidal sinus, and the sphenoidal orifice on each side.
(Author's preparation.)

(particularly when the frontal cavity is the one involved) resolution may take place without suppuration being seen.

The mistake is often made of treating an acute sinusitis as a case of acute catarrh, rheumatism, or influenza; while in an aggravated form it is frequently mistaken for a primary meningitis, phlegmon, or orbital cellulitis.*

Prognosis.—An acute case may end in (a) cure, (b) chronic suppuration, or (c) death. The majority of cases get well spon-

* StClair Thomson, "The Frequency of Orbital Manifestations of Nasal Sinusitis," *Ophthalmoscope*, April, 1908.

taneously. If the condition does not clear up it is due to neglect of treatment which will generally prevent a benign and curable condition from passing into a serious one. If acute sinusitis were recognized and treated, two-thirds of the chronic cases we are called on to treat would disappear (Lermoyez).*

Death very rarely results from a primary acute sinusitis. This occurrence is nearly always associated with the sudden re-awakening of a chronic suppuration. Pyæmia may arise from acute sinusitis, but if the pus is evacuated recovery can take place.†

Resolution may occur within one to three weeks, but complete recovery, unaided by surgical interference, may be delayed for three or four months.‡

Dangers.—The acuteness of the symptoms bears no proportion to the possibility of cerebral complications, nor does the infective organism give any definite warning (Avellis), as fatalities have occurred with streptococci, pneumococci, and staphylococci.§ The subject of cerebral invasion is further studied on p. 253.

Treatment.—The indications are to facilitate the discharge and soothe the pain. The principles of treatment are—(1) rest in bed, (2) very warm moist compresses on the forehead or affected cheek, (3) nasal inhalations of mentholized steam for 5 to 6 minutes every hour (Formulæ 14, 16, and 17), (4) antiseptic gargles (Formulæ 28 to 37), (5) anodynes; and, in the subacute stage, (6) the careful use of warm nose lotions (Formulæ 8 and 9). The nasal douche during the acute stage is useless, because it cannot reach the sinuses, and it is dangerous, as it may wash the pus into the other cavities or the middle ear.

A few doses of antipyrin, phenacetin, aspirin, chloral hydrate, or morphia will secure relief. A spray of adrenalin or cocaine (2 per cent.) will reduce the congested turbinates and facilitate discharge. If the maxillary sinus is affected, any carious or suspicious teeth should at once be dealt with. As soon as free secretion takes place it can be encouraged by the usual methods, otherwise the treatment should be that of the accompanying coryza (p. 107).

The suction apparatus of Sondermann is sometimes helpful, or it may be imitated by the patient holding his own nostrils and then inflating the lungs so as to exhaust the air from the naso-pharynx. Brünings' electric-light head-bath is convenient and useful.

* *Presse Méd.*, 16 Fév., 1895.

† Grunert, *Munch. med. Woch.*, 1903, No. 14; and abstract in *Rev. Hebd. de Laryngol.*, xxv., 1904, No. 38, p. 357.

‡ StClair Thomson, *Practitioner*, Jan., 1907, p. 42.

§ StClair Thomson, *Trans. Med. Soc., London*, xxi., 1906.

Rest, and change to a mild and sunny climate, are frequently beneficial in cases which threaten to become chronic.

Vaccine-therapy.—This, so far, is disappointing. In chronic sinusitis D. Harmer has found that streptococcus and Friedländer vaccines give good results, whilst vaccination with pneumococcus, *B. influenzae*, staphylococcus, and coliform organisms is valueless. In acute streptococcus infection he reports that doses of 100, 500,

and 1,000 millions can be given on three succeeding days with often remarkable results.*

Operation.—If the above measures fail to secure natural drainage, operative treatment may be called for (a) if the symptoms are severe or the case prolonged, (b) if the inflammation shows itself externally by swelling (Fig. 121) or orbital cellulitis (Fig. 122), or (c) if cerebral symptoms declare themselves (delirium, convulsions, coma, rigors).

In the case of the maxillary sinus, if the symptoms are severe, or if resolution does not occur within a few days, the cavity should be punctured



Fig. 121.—Acute frontal sinusitis, supervening in a case of chronic unilateral pansinusitis.

and washed out, as described on p. 258. This simple operation may have to be repeated some six to twelve times.† When the ethmoidal inflammation points externally it is incised, if unrelieved by endonasal treatment, including amputation of the anterior end of the middle turbinal or opening of the ethmoidal labyrinth (Fig. 122). In frontal-sinus cases, if the pain

* *Brit. Med. Journ.*, Feb. 7, 1914, p. 303.

† Logan Turner, *Edin. Med. Journ.*, Aug., 1906, p. 162.

is severe, continuous, or unbearable, or attended with profound constitutional symptoms, and relief does not follow in twenty-four hours on the general treatment advised, we should make an exploratory lavage of the maxillary sinus on the same side, as described at p. 258. The frontal and maxillary sinuses are frequently infected together, and if the lower one is relieved the inflammation in the upper cavity will frequently subside rapidly. But if the frontal symptoms do not abate we should proceed to removal of the anterior end of the middle turbinal and opening up of the anterior ethmoidal and fronto-ethmoidal cells. (This may have to be preceded by a sub-mucous resection if there is a deflected septum obstructing discharge.) Failing this, if the frontal sinusitis produces a sub-cutaneous phlegmon or threatens the meninges, the cavity must be laid open. Before taking this step it is well to determine the presence and size of the sinuses by means of a radiogram; for phlegmon in an orbito-ethmoidal cell will sometimes produce a swelling in the upper eyelid, very suggestive of a frontal origin (Fig. 122). An incision is made through the inner third of the eyebrow down to the periosteum, which is reflected, and the sinus is then opened with a chisel. The fronto-nasal duct is carefully enlarged and the wound in the forehead kept open for some time. Unless there are cerebral symptoms, no attempt should be

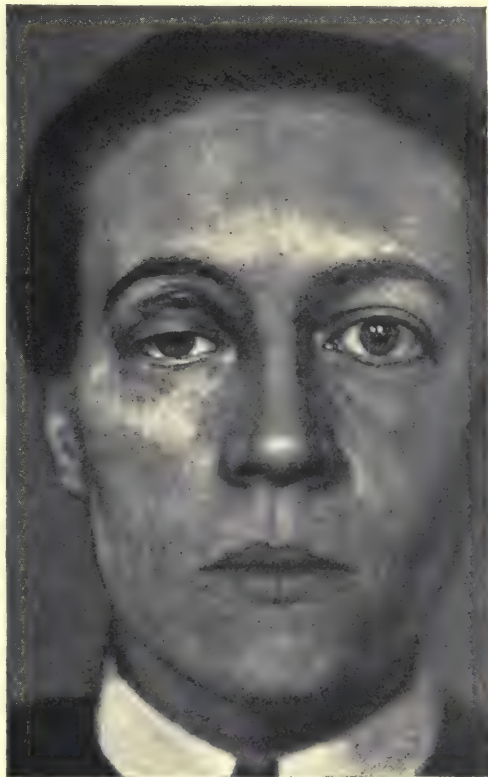


Fig. 122.—Case of pansinusitis.

The case had been regarded as one of "orbital phlegmon," and the right upper eyelid had been incised, leaving a fistula leading to a fronto-ethmoidal cell.

produce a swelling in the upper eyelid, very suggestive of a frontal origin (Fig. 122). An incision is made through the inner third of the eyebrow down to the periosteum, which is reflected, and the sinus is then opened with a chisel. The fronto-nasal duct is carefully enlarged and the wound in the forehead kept open for some time. Unless there are cerebral symptoms, no attempt should be

made to carry out the radical operation, to be described later, even if the case is found to be one of recent exacerbation in a chronic sinusitis. It is better to rely on this simple drainage of the frontal sinus until the acute stage is passed.

When acute suppuration in the sphenoidal sinus does not resolve, the cavity must be washed out and the ostium, if necessary, enlarged (p. 301).

CHRONIC SUPPURATION

This occurs much more frequently in the accessory sinuses than was formerly supposed. It is encountered in at least 2 per cent. of the patients attending a throat clinic,* and evidence of sinus disease is found in 30 to 50 per cent. of cases in post-mortem observations.† The maxillary sinus is the one most often affected.

Symptoms.—Patients afflicted with an empyema frequently seek relief on account of the discharge, or the obstruction, or of a “chronic cold in the head.” If inspection leads to the discovery of pus in the nose, the probability of sinus disease is at once manifest, and the application of certain tests will render its presence certain. But a large number of cases are overlooked in practice in consequence of a want of knowledge of the various consequences of sinus suppuration. Although, strictly speaking, these are sequelæ of the disease, it appears more practical to study them as symptomatic. Some of them may occur with pus in any cavity.

SYMPTOMS COMMON TO EMPYEMA IN ANY ACCESSORY CAVITY

Presumptive evidence of an empyema.—Pus in one or more accessory cavities will produce symptoms which may be grouped in three classes:—

1. Symptoms in neighbouring regions—the nasal chambers, pharynx, eyes, ears, head and face.
2. Symptoms in more distant organs—the lower respiratory tract and digestive tube.
3. Symptoms of interference with general health—prostration, loss of weight, fever, etc.

1. Symptoms in neighbouring regions. *Nasal symptoms.*—The two most usually complained of are (1) obstruction, and

* Fein, *Wien. klin. Woch.*, 1898, No. 28, p. 701.

† Harke, E. Fraenkel, Lapelle, and Martin. Quoted by F. Martin, “De la Fréquence de l’Empyème.” Bordeaux, 1900.

Kiaer, *Laryngoscope*, vi., 1899, No. 2, p. 81.

T. S. Kirkland, xvii., *Journ. of Laryngol.*, 1902, No. 11.

Joseph P. Tunis, *Laryngoscope*, xx., Oct., 1910, No. 10, p. 931.

(2) discharge. The obstruction may be unilateral or bilateral; it is usually more marked in the morning hours, and varies with the amount of secretion, the weather, the general health, the cavities affected, and any recent increase of catarrh. The discharge may flow forwards or backwards—in the latter direction chiefly when the posterior group of sinuses is affected (p. 239). It presents many varieties of pus and muco-pus, both in quality and amount. It may necessitate the use of as many as a dozen and a half handkerchiefs in the twenty-four hours. Sometimes it is so slight that patients have unconsciously swallowed it for years.

Hypertrophic rhinitis, atrophy of the nasal mucosa, rhinitis caseosa, and nasal polypi may all be traceable to sinusitis. Disorders of smell and taste are often indicative of the disease. There may be parosmia, or anosmia. Cacosmia is, when complained of, very symptomatic of sinus suppuration. The smell is seldom perceptible to the patient's friends, and this helps to distinguish it from the smell of true ozæna, which can be perceived at some distance, although undetected by the patient.

Symptoms in the naso-pharynx and pharynx.—Postnasal catarrh and Tornwaldt's disease (bursitis pharyngea) are often symptomatic of sinusitis, as may also be inflammation, suppuration, and abscess in the pharyngeal and palatine tonsils, the pharynx, and the cellular tissues of the neck.

*The eyes.**—Symptoms in the orbit or eye may be produced

- * J. H. Bryan, *Journ. Amer. Med. Assoc.*, Nov. 11, 1899, p. 1197.
 Ziem, *Journ. of Laryngol.*, Aug., 1901, p. 417, and May, 1910, p. 242.
 Ziem, *Arch. Internat. de Laryngol.*, xxi., 1903, No. 6, p. 1173.
 R. Sattler, *Journ. Amer. Med. Sci.*, May 18, 1901.
 de Milly, *Bull. de Laryngol.*, iv., 1901, p. 79 (a Thesis).
 A. Robin, *ibid.* (a Thesis).
 F. de Lapersonne, *Ann. des Mal. de l'Oreille*, xxviii., 1902, No. 9, p. 217.
 Schmiegelow, *ibid.*, xxxi., Jan., 1905, p. 84.
 Paul Joly, *Rev. Heb. de Laryngol.*, xxv., 1904, No. 15, p. 427.
 G. Gellé, *Arch. Internat. de Laryngol.*, xvii., 1904, No. 1., p. 8.
 G. Laurens, *Gaz. des Hôp.*, 7 Sept., 1895, p. 1021.
 E. Baumgarten, *Journ. of Laryngol.*, xxi., Aug., 1906, 400.
 E. Berger and T. Tyрман, "Die Krankheiten der Keilbein-Höhle und des Siebbein-Labyrinthes und ihre Beziehungen zu Erkrankungen des Sehorganes." Wiesbaden, 1886.
 Emile Moreau, "Manifestations Oculo-orbitaires des Sinusites Sphénoïdales." Lyon, 1905.
 Oscar Eversbuch, Graefe-Saemisch, "Handbuch der Gesamten Augenheilkunde," Kapitel xvi., 2e Auflage. (Gives a full study, with bibliography.)
 A. Onodi, *Journ. of Laryngol.*, Dec., 1904, p. 622; *ibid.*, Aug., 1907, p. 382.
 StClair Thomson, *Ophthalmoscope*, April, 1908, p. 228.
 Logan Turner, *Brit. Med. Journ.*, ii., 1908.
 Logan Turner, *Edin. Med. Journ.*, May, 1909.
 O. Chiari and H. Marschik, *Medizinische Klinik*, iv., 1908, No. 16, S. 576.
 Christian R. Holmes, *Laryngoscope*, xviii., Nov., 1908, p. 898.
 Hanau W. Loeb, *ibid.*, xix., Jan., 1909, p. 57.
 A. S. Cobbledick, *Brit. Med. Journ.*, May 28, 1910.
 A. Onodi, "The Optic Nerve and the Accessory Sinuses of the Nose." Translated by J. Lückhoff. London, 1910.
 A. Onodi, *Journ. of Laryngol.*, xxvii., 1912, No. 1, p. 9.

either directly, (1) by obstruction or infection of the lachrymal passage, and consequent conjunctival affections; or (2) by inflammatory extension, producing orbital cellulitis (Fig. 122), periostitis of the orbit, and retro-ocular phlegmon; or reflexly, (3) by inducing chronic conjunctival blepharitis, phlyctenular keratitis, diminution of the field of vision,* asthenopia, scotomata, photophobia, dilatation of the pupil, blepharospasm, and ptosis. Iritis, cataract (Ziem), hæmorrhagic retinitis (Kuhnt), and glaucoma have been observed. Optic neuritis has been more frequently met with; in 36 consecutive cases of it, disease in the nasal accessory sinuses has been present 26 times.†



Fig. 123.—Localization of headache in sinus suppuration.

1. Acute maxillary suppuration; 1-2, acute maxillary or frontal suppuration; 3, chronic frontal sinusitis; 4-5, ethmoidal or sphenoidal suppuration; 5, sphenoidal suppuration. (Skillern.)

Ears.—Tinnitus, vertigo, earache, Eustachian catarrh, and purulent otitis media may first attract attention to a sinusitis.‡

Cranium.—Headache, faceache, hemicrania, and neuralgia are apt to be so symptomatic of a sinus affection that they always entail an exploration of these cavities (Fig. 123). Faceache or neuralgia may present a certain periodicity, increasing for some hours after rising in the morning, and often disappearing as the day goes on. This is explained by the accumulated secretion of the night escaping from the cavity during the early waking hours. Such cases have been mistaken for "brow ague," and have been attributed to malaria.

Cutaneous affections of the face.—Eczema of the nostrils and upper lip, erythema, œdema fugax, abscesses of the face, and attacks of facial erysipelas are among the more unusual symptoms of empyema.

2. Symptoms in more remote parts. *Larynx and respiratory tract.*—Unexplained cough, acute and chronic laryngitis, laryngitis sicca, chronic bronchorrhœa, asthmatic attacks, and recurrent outbreaks of broncho-pneumonia simulating pulmonary

* G. F. C. Wallis, *Journ. of Laryngol.*, xxvi., 1911, Nos. 5 and 10, pp. 242 and 511.

† H. Manning Fish, *Brit. Med. Assoc.*, 1907; *Ophthalmoscope*, April, 1908, p. 243.

‡ J. H. Bryan, "Relation of Diseases of the Posterior Sinuses to Painful Conditions of the Ear," *Laryngoscope*, xxii., 1912, No. 12, p. 1362.

tuberculosis, have in various instances been found to be symptomatic of absorption of nasal pus. In pneumonia, as in acute pneumococcus meningitis, the results of post-mortem examinations indicate that the portal of entry is, in most cases, an accessory nasal sinus.*

Digestive tract.—Gastric disturbances, obstinate vomiting, and diarrhœa may be traced to the descent of pus into the stomach.

Vascular system.—

Anæmia, phlebitis, and bradycardia have been found associated with the affection under consideration.

3. General symptoms.—Among the conditions which have in some instances been traced to a sinus empyema are those of general ill-health, loss of weight, feverish attacks simulating typhoid or malaria, pyæmic metastases, insomnia, or marked somnolence in the daytime. Various cerebral conditions are not infrequently traceable to it, such as irritability, loss of memory, languor, weariness, stupor, ap-
 rosexia, neurasthenia, melancholia, and weakened resistance to the action of alcohol and tobacco.†



Fig. 124.—Sequela of sphenoidal sinus suppuration.

Thrombosis of the cavernous sinus. Shows the œdema of the eyelids, proptosis, chemosis, ophthalmoplegia, and commencing ulceration of the conjunctiva.

Intracranial complications may follow on suppuration in a sinus (1) by infection of the diploë; (2) by infection through the venous or (3) lymph channels of the bone, without any palpable trace of the route of infection; (4) by caries and destruction of the

* Darling, quoted by C. R. Holmes, *Journ. of Laryngol.*, xxiv., 1909, No. 5, p. 281.

† Bosworth, *N.Y. Med. Journ.*, Oct. 12, 1895.

sinus wall, so as to allow of the pus coming into direct contact with the meninges; * or (5) by mischief spreading along the ophthalmic vein to the cavernous sinus. These complications call for prompt treatment by relieving all tension, and, where necessary, opening the cranial cavity.

The maxillary sinus is the least likely to be the source of intracranial infections. Pus in the ethmoidal labyrinth is most prone to set up meningitis; in the frontal sinus it may be followed by abscess in the frontal cerebral lobe; † while sphenoidal sinusitis is more frequently the source of thrombosis of the cavernous sinus, ‡ or basal meningitis (Fig. 124).

Prognosis.—In chronic sinusitis there is little tendency to spontaneous recovery, though temporary alleviation is very common. If left untreated the pyogenic process is apt to spread to the other sinuses.

Treatment must be mainly surgical. Vaccinotherapy, in my experience, has been ineffectual. § In other hands it has proved satisfactory in a few cases, so that it might be tried where the patient shrinks from radical operation. Fair drainage should first be secured. ||

* H. Tilley, *Proc. Roy. Soc. Med.*, Laryngol. Section, Nov., 1911. (Records a case of frontal sinusitis in which the contents of the orbit below and the dura mater behind assisted in forming the walls of a large empyema.)

† For a case of cerebral abscess consequent on frontal sinusitis, and successfully operated on, see L. V. Cargill, W. Turner, and StClair Thomson, *Proc. Roy. Soc. Med.*, Laryngol. Section, i., 1908, p. 125.

‡ StClair Thomson (*Trans. Med. Soc., London*, xxix., 1906) records a case of thrombosis of the cavernous sinus, and one of basic meningitis, both proved by autopsy to be due to sphenoidal sinusitis, and gives notes of 40 others recorded in literature.

A. Onodi, *Laryngoscope*, xix., 1909, No. 11, p. 801.

M. Paunz, *Arch. f. Laryngol.*, 1903, 13. (Full bibliography.)

Seifert, *Rev. Hebd. de Laryngol.*, xxvi., i., 1905, No. 24. (Gives various references.)

Milligan, *Medical Chron.*, Jan., 1899.

§ Joseph C. Beck, *Laryngoscope*, May, 1908.

Birkett, Meakins, Coakley, Kendall, F. C. Cobb, and E. W. Nagle, *Trans. Amer. Laryngol. Assoc.*, 1910, pp. 94–116.

|| K. W. Goadby, *Journ. of Laryngol.*, xxiii., Nov., 1908, p. 624.

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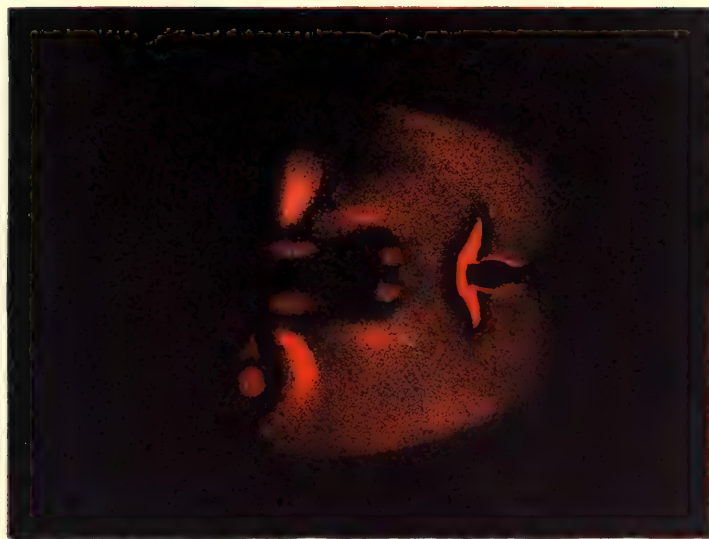
Campbell and Rowland, *Journ. of Laryngol.*, 1910, p. 437. (Fatal acute pneumococcic meningitis secondary to empyema of the frontal sinus.)

H. L. Gregory, *Journ. of Laryngol.*, xxvii., 1912, No. 10, p. 538. (Fatal acute pneumococcic cerebro-spinal meningitis secondary to chronic suppuration in posterior ethmoidal cells.)

H. P. Mosher, *Laryngoscope*, Aug., 1914. (The orbital approach to the cavernous sinus.)



Fig. 1.—On the patient's left side transillumination is normal. On the right side, owing to pus in the cavity, there is no transillumination of the antrum.



Transillumination of the maxillary sinus.

Fig. 2.—On the patient's right side transillumination is normal. On the left side the antrum has been packed with gauze, which permits of the infra-orbital crescent of light and of the lachrymal tache, but the sclerotic and pupil are not lit up. (*A. Brown Kelly.*)

CHAPTER XV

CHRONIC SUPPURATION IN THE MAXILLARY SINUS

Synonyms.—*Empyema of the antrum of Highmore; maxillary sinusitis.*

The **symptoms** may be any of those enumerated as common to pus in an accessory cavity (pp. 250-4). If the secretion of pus is so small that it only overflows occasionally into the nasal chambers the objective symptoms may be slight, although the patient complains of cacosmia, neuralgia, faceache, and so forth. In a doubtful case the patient should be examined in the morning hours, since, after mid-day, the sinus has often become so emptied that no pus escapes into the nose during the rest of the day. When the ostium is obstructed, and when an acute exacerbation is grafted on the chronic condition, attention may be directed to the affected sinus by the redness, swelling, and tenderness of the cheek and lower eyelid on the same side.

Pain over the maxillary sinus is no necessary part of chronic suppuration in the cavity. It is much more common with an acute sinusitis (cf. p. 245) or during an exacerbation of a latent empyema. It is well to remark that local pain is even more suggestive of periostitis, tertiary syphilis, or a malignant growth of the antrum. Still, it does occur, generally during any fresh "cold in the head," and it is sometimes referred to the forehead and not to the cheek, even when the frontal sinus is healthy and it is the maxillary cavity which is purulent (Fig. 123, p. 252).

Examination of the nostril on the affected side will generally reveal pus in the middle meatus, and in the posterior choana it is seen lying below the end of the middle turbinal. But the pus may also have spread to the olfactory cleft, or have accumulated on the floor of the nose. To determine the exact source, the nose should be carefully wiped out with pledgets of cotton-wool moistened with 2-5 per cent. cocaine, and examined after a few minutes, when pus will have reappeared under the middle turbinal.

Posture test.—Supposing the pus does not speedily make its reappearance, the patient should bend the head well forwards between the knees, with the affected side uppermost. This test, known as Fraenkel's, brings the ostium maxillare into the most dependent point of the sinus, so that when the head is raised, and the nose again inspected, a stream of pus will be found in the middle meatus.

The test of transillumination, chiefly developed by Heryng, sometimes affords confirmatory evidence. It requires a small 5-candle electric 10-volt globe, of about 1 ampere current, encased in a glass cover, which can be detached and disinfected (Fig. 125). The examination must take place in a completely darkened chamber, or else the heads of both patient and physician should be enveloped in a thick black cloth, such as that used by photographers. Any

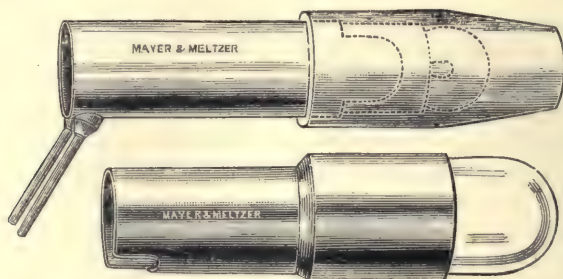


Fig. 125.—Lamp for transillumination.

The upper figure shows the vulcanite cap used when the frontal sinuses are being illuminated. The lower figure shows the detachable cover employed when the lamp is introduced into the mouth.

denture present having been removed, the lamp is introduced into the centre of the patient's mouth, and the current switched on (Plate v.). In normal conditions the rays of light pass upwards and outwards unopposed through the hollow cavities of the face, producing (1) a diffused glow over the lower part of the cheek and between the separated jaws, (2) a semilunar patch of light immediately below the lower eyelid, (3) a subjective sensation of light by the patient, and (4) illumination of the pupils by the rays penetrating the sclerotic, so that the centre of the eye is lit up and glows like a cat's in the dark. When pus is present in the antrum the passage of the rays is so obstructed that all these phenomena are diminished or abolished (Plate v.). I have found that the most reliable information is obtained by depressing the patient's lower eyelid. The sclerotic is then lit up, and the eyeball becomes translucent around the iris if the antrum is clear. If the passage of light through this cavity is impeded, the sclerotic

remains opaque. When both sides are affected, the value of the transillumination test is diminished, as the standard of comparison is wanting. A negative result would suggest that the pus seen in the middle meatus came, not from the maxillary, but from the frontal sinus.

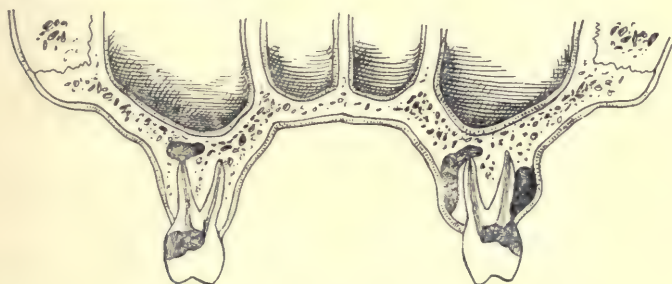


Fig. 126.—Relation of dental disease to suppuration in the maxillary sinus (semi-diagrammatic).

The right side shows caries of the crown of a first molar tooth, and an abscess at the root. On the left side a pyorrhoic pocket of pus is seen on the outer side, and a watch-glass swelling on the palatine side. (*After Mahu.**)

The evidence afforded by transillumination may in itself be misleading. Thus it may give positive results in the absence of an empyema, owing to (1) small size or complete absence of the sinus ;

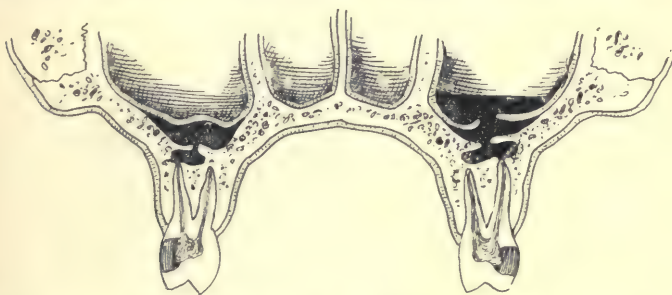


Fig. 127.—Relation of dental disease to antral suppuration (semi-diagrammatic).

On the right side the abscess at the root of a molar tooth has broken into the antral cavity, but has pushed the muco-periosteum in front of it. On the left side the dental suppuration has burst into the cavity of the maxillary sinus. (*After Mahu.*)

(2) abnormal thickness of bony tissue ; (3) permanent thickening and opacity sometimes remaining in the lining of the cavity after complete cure of suppuration ; or (4) the presence of malignant or other neoplasm. On the other hand, transillumination may give

* *Annales des Mal. de l'Oreille*, xxxii., ii., No. 10, Oct., 1906, p. 353.

negative evidence, although the antral cavity is diseased, owing (a) to the cavity happening to be more or less empty at the time of examination, or (b) to the bones being particularly thin and translucent.

The test is, in fact, only a supplementary one. If it gives a

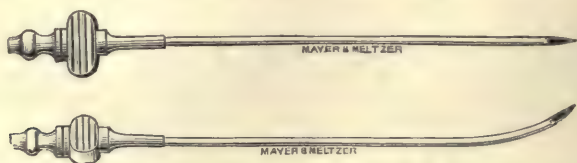


Fig. 128.—Hollow needles for exploring and washing out the maxillary sinus.

positive result it may be confirmatory, or arouse enough suspicion to justify an exploratory lavage; if negative, it may point to other cavities as the source of the pus.

Conclusive evidence of a maxillary sinusitis can only be obtained by the expulsion of pus from the cavity. This is done by exploring

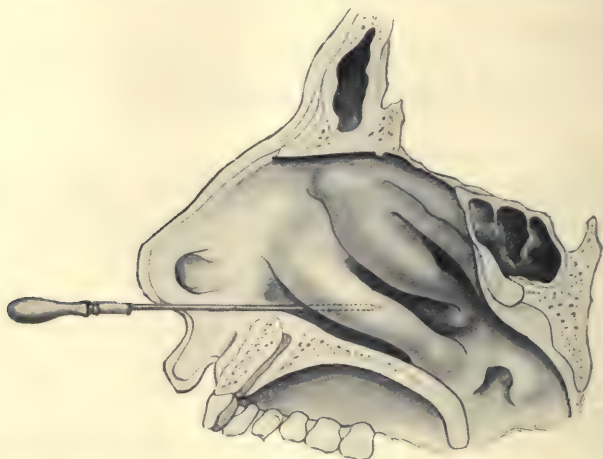


Fig. 129.—Exploratory puncture of the right maxillary sinus.

the cavity from (1) its nasal wall, (2) the alveolar border, or (3) the canine fossa.

Exploratory puncture and lavage of the antrum.—This can be carried out under cocaine and adrenalin. A pledget of cotton-wool, or strip of ribbon gauze, soaked in a mixture of equal parts of adrenalin and 20 per cent. cocaine, is tucked well

under the inferior turbinal, and left there for ten to thirty minutes. The anterior part of the septum on the same side is also anæsthetized. A stout hollow needle, either straight (Lichtwitz) or curved at the extremity (Schmidt, Myles) (Fig. 128), is directed high up under the concavity of the inferior turbinal, at about the junction of the middle and posterior third of the nasal passage—i.e. 1 to 1½ inches from the orifice of the nose (Fig. 129),—and, while the patient's head is steadied with the left hand, the needle is pushed through the thin antro-nasal wall, in a line directed towards the outer angle of the orbit (Fig. 117, 15). The point



Fig. 130.—Surgical anatomy of the nose.

Coronal section of the nose and maxillary sinuses. The two probes indicate the point for traversing the outer nasal wall in exploratory puncture of the maxillary sinus. On the left side is illustrated the possible danger of entering the orbit. Note that the nasal floor is on a higher level than that of the antra, into which project the domes over the molar teeth.

of the needle is felt free in the sinus, and a rubber bag (such as that used for Politzerizing the middle ear) is attached to the proximal end, and air is pumped through the cavity. Pus and air-bubbles will be seen appearing below the middle turbinal, while the foul odour of the secretion may be only too perceptible. This proceeding should be followed by syringing through the hollow needle a tepid solution of sterile, normal, saline fluid or boric lotion. The syringing should be done with some force, as the secretion may be very inspissated, the cavity tortuous, or the natural opening obstructed.

The pus expelled is sometimes fetid and frequently flocculent. A small amount of, or even a decided turbidity, is sufficient to settle

the diagnosis of empyema. Any trace of pus is well shown up if the lotion is received into a black vulcanite tray (Fig. 140). When the lotion comes away clear, air should be freely insufflated so as to expel any remaining liquid. Should these procedures fail to reveal a suspected collection of pus, a small quantity of

10-vol. hydrogen peroxide is syringed through the hollow needle. Its effervescence with any pus will bubble out into the meatus.

Exploration of the maxillary sinus from the middle meatus is not generally advised, owing to the risk of the needle traversing the cavity and entering the orbit (Fig. 130); but if Killian's short, angular needle is employed, it may be done with safety.

Complications.—This exploratory puncture and lavage of the antrum is generally looked upon as a slight and perfectly safe procedure. I have never had trouble with it myself, beyond occasional cases of faintness from cocaine intoxication. But Brown Kelly has thoroughly investigated the difficulties and dangers, and has published a variety of recorded accidents. Some of these were due to traumatism, shock, or cocaine; but the cases of convulsion and coma, and the nine fatal cases reported by various

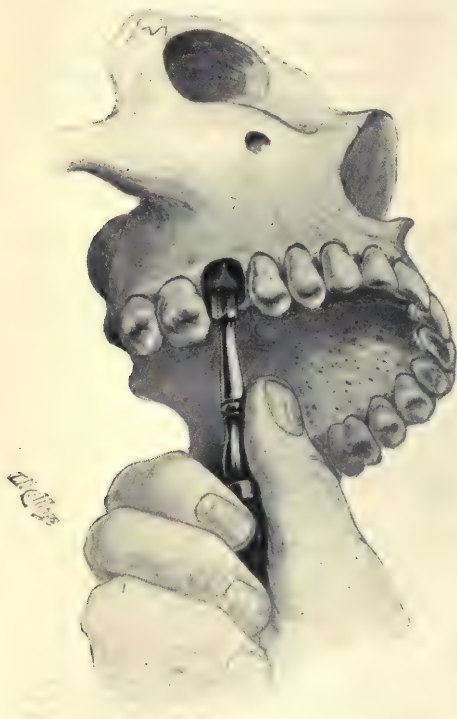


Fig. 131.—Drilling the alveolar wall of the maxillary sinus.

The inner (palatine) socket of a molar tooth, preferably the first, is selected. The thumb is placed at a short distance from the extremity, to steady the instrument and to prevent it from plunging too deeply into the cavity.

observers, are difficult to explain. One fatal case followed on simple perforation of air into the frontal sinus. As precautionary measures I should advise that the cocaine and adrenalin be used sparingly and applied directly to the antro-nasal partition, that no perforation or lavage be tried until it is felt that the point of the needle is free in the antral cavity, and that no force be employed in injecting air or lotion.*

* A. Brown Kelly, *Journ. of Laryngol.*, xxix., Dec., 1914, No. 12, p. 556.

Exploration of the antrum from a tooth socket.—If, on the suspected side, there is a carious bicuspid or first molar tooth, or if one of these tooth sockets is empty, we can not only explore the cavity from the alveolar border, but, at the same time, initiate the treatment by drainage. The removal of a diseased tooth and the drilling of the alveolus can both be carried out under the same anæsthesia, preferably that of nitrous-oxide gas. A large-sized hand-drill is employed (Fig. 131). The use of a dental engine or an electro-motor is unnecessary. They are less under control and less certain. The point of the drill is directed vertically to

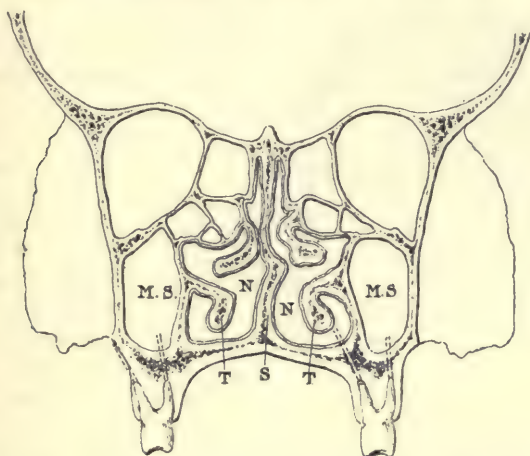


Fig. 132.—Surgical anatomy of the maxillary sinus.

Semi-diagrammatic coronal section of the nose, with the maxillary and ethmoid sinuses. The roots of the first molar teeth have been sketched so as to show that the drilling of a tooth socket might lead on to the cheek, or into the nasal cavity, if the directions in the text for reaching the maxillary sinus were not observed.

the alveolus, and in a plane with the centre of the patient's eye. Firm pressure, with a few rotatory movements, is sufficient quickly to perforate the floor of the antrum. The drill is prevented from plunging in too far by the operator's thumb being steadied about an inch from the extremity.

A preliminary inspection will help to assure the success of this operation. Thus, if the facial surface of the superior maxilla is very flattened, the hard palate arched, or the nasal chamber on the same side wider than usual, greater care must be taken in seeing that the drill does not miss the antrum by passing (a) outwards beneath the cheek, (b) inwards through the floor of the nose, or even (c) into the roof of the mouth (Fig. 132). The

buccal socket of a molar tooth is preferable to a labial (Fig. 133). It is rare for this simple operation to be attended with a serious hæmorrhage.*

As the drill is withdrawn the escape of pus will often confirm the diagnosis. When the patient has recovered from the anæsthesia the lotion and air should be sent through the cavity, as already described, and an obturator of rubber inserted to maintain the patency of the opening for future treatment (Fig. 139, p. 267). If the result of the exploration is negative, no harm is done, and

the opening, if left alone, will close up in twenty-four hours.



Fig. 133.—The teeth-sockets of the upper jaw.

The drawing shows that the first and second molars have, as a rule, three sockets. Two of these are on the outer (labial) surface. The single, inner (palatine) socket is the one which should be preferred for drilling an opening into the maxillary sinus.

Exploration through the canine fossa.—This route is unsatisfactory, as it is more painful and not well suited for establishing treatment. It need only be adopted when no tooth-socket is available, when attempts to explore the antrum from the nose have failed, and when the diagnosis cannot otherwise be established. It can be carried out under nitrous-oxide gas or local anæsthesia. A small incision is made down to the bone just behind the prominence of the canine

fang; the muco-periosteum is reflected upwards and downwards, and a drill is employed as for the alveolar opening, but directed vertically to the surface of the canine fossa. The exploration of the contents is carried out as already directed.

Diagnosis.—Obstructed cases have been mistaken for malignant disease of the antrum; and, on the other hand, the association of suppuration with a neoplasm has led to failure to recognize the latter. The age of the patient, exploratory puncture, and careful examination both of the canine and nasal walls will prevent any error in diagnosis. A dental cyst does not communicate with the nose, and, when explored, cannot be washed through into the nasal cavity (cf. Fig. 167, p. 312). Acute suppuration might be mistaken for dental periostitis. The latter is an external affection,

* Scheppegeirell, *Journ. of Laryngol.*, ix., 1895, No. 9, p. 621.

whose progress can be watched, and the tests given will show the freedom of the antral cavity. Maxillary sinusitis in children is rare, and acute osteo-myelitis of the superior maxilla is apt to be mistaken for it.*

TREATMENT

In all cases the teeth should be attended to. Treatment of a maxillary sinusitis can be carried out (1) through the natural orifice, or (2) through the nasal, (3) the alveolar, or (4) the facial surfaces of the cavity.

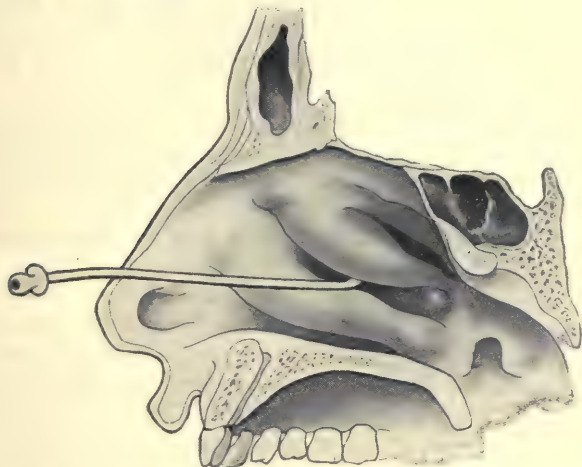


Fig. 134.—Method of catheterizing the maxillary sinus.]

1. **Through the natural orifice.**—Daily irrigation of the cavity by this route has been recommended by a few rhinologists.† It is a difficult and untrustworthy method (Fig. 134).

2. **Through the nasal wall.**—Cases occur in which a single exploration and lavage from the inferior meatus, as described on p. 258, has been followed by permanent cessation of suppuration. It is therefore wise to defer further treatment after an exploratory lavage until pus is again evident in the nasal chamber. The success of a single treatment is perhaps due to the fact that the case was really a recent one undergoing spontaneous cure. Such cases in elderly people should be viewed with suspicion, as they are sometimes found to be due to suppuration in connexion

* Schmiegelow, *Arch. f. Laryngol.*, v., 1896, p. 125.

Ropke, *Münch. med. Woch.*, Jan. 25, 1898.

A. Brown Kelly, *Journ. of Laryngol.*, xxviii., 1913, No. 9, p. 497.

† Garell, *ibid.*, viii., 1894, No. 8, p. 530.

Norval H. Pierce, *Laryngoscope*, xi., 1901, No. 9, p. 197.

with a malignant growth. This treatment by lavage is worth a trial in all recent cases, i.e. where there is a history of symptoms of a few weeks' to a few months' duration. I generally suggest a treatment three times a week for three weeks. If there is decided and progressive diminution in the amount and purulence of the discharge, the lavage may be repeated at increasing intervals, particularly if the discharge shows a relatively small number of lymphocytes, and an absence of the *Streptococcus pyogenes*.* It is difficult to say beforehand what prospect there is of curing a chronic case by lavage through the nasal wall. It is not worth trying more than half a dozen times unless there is decided improvement, and it is rarely curative in cases of over six months' duration.

Making an opening in the antro-nasal wall.—The creation of a large opening in the antro-nasal wall, so as to permit of drainage and treatment through the inferior meatus, has lately come much into favour. Originally suggested by John Hunter, the method was carried out by Mikulicz and Krause, and has been developed by Réthi and Claoué.†

Anæsthesia.—The operation, after preliminary preparation of the nose (*sæ* p. 75), can be performed under an anæsthesia of nitrous oxide and ether, or chloroform can be employed. On the Continent and in America it is frequently carried out under local anæsthesia. The nose on the affected side is packed with adrenalin and cocaine, and a 1 per cent. solution of novocain or $\frac{1}{8}$ gr. of eucaine (p. 75) is injected into the antral cavity by means of a hollow needle thrust through the inferior meatus, as described on p. 258.

Operation.—If the inferior turbinal approaches so near the nasal floor that it threatens to interfere with the operation, or with the subsequent drainage from the sinus, the anterior third is amputated, as described on p. 135 (Fig. 72, p. 132). With a Krause trocar and cannula (Fig. 137), a chisel and hammer, a trephine, or a dental burr, an opening is then made through the antro-nasal wall, below the attachment of the inferior turbinal (Fig. 135). The opening is made as large as possible, both backwards and forwards, by the use of punch-forceps or burrs (Figs. 136 and 138). The ridge remaining of the antro-nasal wall is levelled down. Sometimes the maxillary sinus can be explored through the opening by introducing the little finger by way

* J. M. Darling, A. Logan Turner, and C. J. Lewis, *loc. cit.*

† L. Réthi, *Wien. med. Woch.*, 1901, No. 52; 1903, No. 12; 1904, No. 34; and *N.Y. Med. Journ.*, Feb. 9, 1907.
Claoué, *Semaine Méd.*, 15 Oct., 1902.

of the nostril. Any polypoid tissue on the floor of the cavity is scooped away.

If there is much bleeding, the sinus is plugged for twenty-four hours with ribbon gauze.

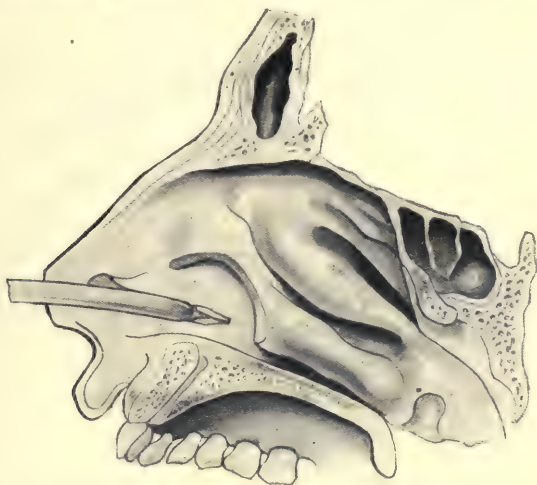


Fig. 135.—Operation on the maxillary sinus.

Breaking through the antro-nasal wall from the nose, after amputation of the anterior extremity of the inferior turbinal.

Modification.—If the inferior turbinal does not come low down on to the floor of the nose, it need not be interfered with.

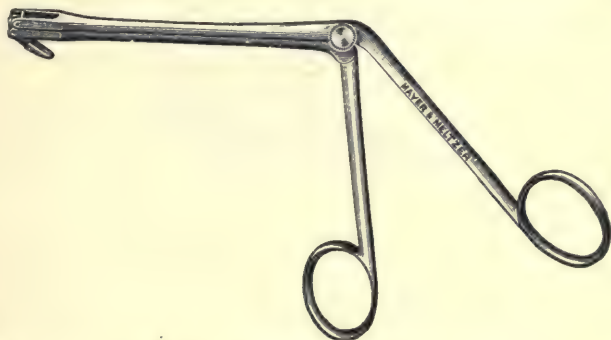


Fig. 136.—Ostrom's anterior cutting punch-forceps, for enlarging the antro-nasal opening.

After-treatment.—It is well to leave the operated district alone for three or four days. Then the nose may be cleaned with a warm

alkaline lotion (Formulae 8 to 11, p. 801), and the antrum washed out with an occasional lavage of a pint of warm, sterile, salt solution (3i to Oi). The washing is carried out with a Higginson syringe and a full bore, but short length, silver Eustachian catheter.

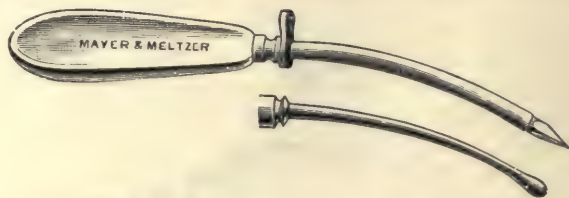


Fig. 137.—Krause's trocar and cannula.

The patient soon learns to do this for himself. It is gradually discontinued as the discharge diminishes and becomes less purulent. The edges of the antro-nasal opening and the interior of

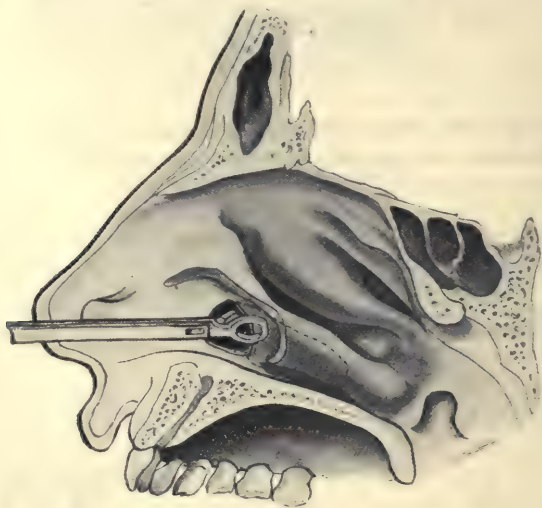


Fig. 138.—Maxillary sinus operation.

Enlarging the opening in the antro-nasal wall backwards, after removal of the anterior end of the inferior turbinal.

the cavity may occasionally be painted out with a solution of nitrate of silver (2 to 5 per cent.), protargol or argyrol (25 per cent.).

Advantages.—It is claimed for this method that it can be performed easily and rapidly, produces little shock, does not leave

troublesome neuralgia of the cheek or anæsthesia of the teeth, and that the after-treatment is slight.

Results.—If the sinusitis is uncomplicated by pus in other cavities, excellent results are claimed for this method.* According to Logan Turner, the method may in the first instance be practised in chronic cases when the pneumococcus and staphylococci are the predominant organisms. When in the same class of cases the streptococcus pyogenes is the virulent organism, or when the streptococcus is associated with the presence of squamous epithelium and excess of lymphocytes, a more radical operation should be advised and practised.†

Indications.—This operation does not allow of the inspection of the cavity, or complete removal of diseased contents. But it can be employed in patients (*a*) who have intact upper teeth on the affected side, or (*b*) who decline more arduous treatment, and (*c*) as a preliminary to the radical (Caldwell-Luc) operation, of which it forms a necessary step. It is free from danger, and does not require so much technical skill as the radical operation.

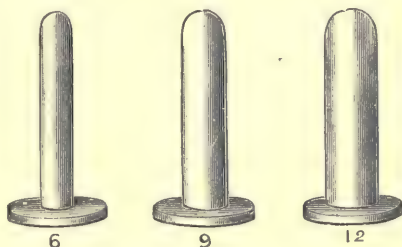


Fig. 139.—Soft rubber obturators for maintaining the patency of the opening in the maxillary alveolus.

The size numbered 7 or 8 is generally large enough. A hard vulcanite obturator is more comfortable for the first few days.

3. Through the alveolar border.—This method of gaining access to the maxillary sinus, often referred to as Cowper's, has already been described. The permanency of the opening is maintained by a solid rubber or metal obturator; this can be fitted to a denture (Fig. 139). The obturator is removed and cleansed while the cavity is washed out with a Higginson syringe (Fig. 140). A pint of tepid sterile fluid is employed each time, and the medication used with it does not appear in most cases to be of great importance. Normal saline solution is generally satisfactory, and in cases of fetor we may add peroxide of hydrogen, tincture of iodine, listerine, sanitas, or one of the non-irritating compound antiseptics. At first the washing out should take place morning and evening, the obturator being inserted immediately afterwards. If this is neglected, granulations spring up within an hour, or less, sufficient

* C. A. Parker, *Brit. Med. Journ.*, Oct. 10, 1908, p. 1099.

† Logan Turner, *ibid.*, Oct. 10, 1908, p. 1096.
J. M. Darling, *Edin. Med. Journ.*, Dec., 1909.

to impede or even entirely prevent replacement. When the liquid escapes from the nose in a clear stream the washings are diminished to once a day, then to every other day, and so gradually to once a week. When the cavity on several occasions is found to be free from secretion after remaining uncleansed for a week or two, we may consider the case cured, and allow the alveolar opening to close—which it does spontaneously on discontinuing the obturator.

If the secretion persists, we may try the use of stronger antiseptics or astringents, such

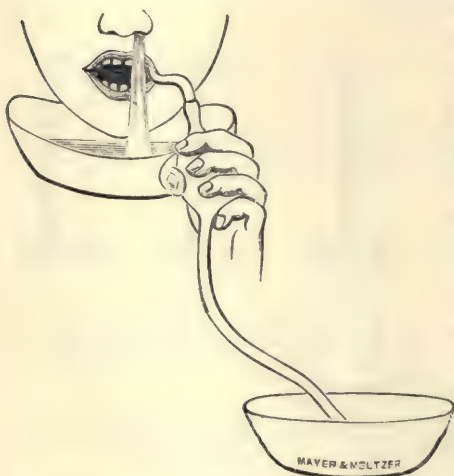


Fig. 140.—Syringing out the left antrum from an opening in the alveolar border.

as biniodide of mercury, chinosol, protargol, argyrol, sulphate of zinc, before resorting to more radical measures. Sometimes when the secretion is tenacious or grumous it is well to introduce some peroxide of hydrogen into the cavity.

Results.—Cases which are going to yield to this method show improvement within a few weeks, and are generally well within three months. In some cases the treatment has to be kept up for a year or more, though with less prospect of complete

arrest. In many such cases only a trace of muco-purulent secretion remains, requiring a lavage once or twice a week. Although subject to exacerbations after contracting an acute catarrh, patients frequently prefer to tolerate the inconvenience and wear an obturator indefinitely rather than submit to operation. When any other sinus on the same side is suppurating, the alveolar opening should be maintained, both from fear of re-infection, and because it might otherwise act as a reservoir for the pus from the frontal or ethmoidal cavities.

Indications.—When a suitable tooth-socket is available this treatment may be given a trial. It is also sufficient in those patients whose age, health, debility, or circumstances prevent more promising but more trying treatment. If there is no suitable decayed

tooth or empty socket, it is not justifiable to sacrifice a sound tooth to try a method of treatment which is uncertain in its results. In such cases, and in those where this method has failed, operative treatment must be carried out through the canine or nasal walls of the cavity.

4. **The canine fossa operation.**—The original operations of Desault and Küster consisted in opening the canine fossa, and carrying out all subsequent treatment through this orifice. The results were unsatisfactory. The making of a double opening through both the canine and nasal walls of the antrum was carried out by Scanes Spicer.* The operation, as now generally performed, was designed by Caldwell,† and independently by Luc,‡ who has given considerable attention to the subject.

The principles of this operation are (1) free access to the cavity, which can be carefully examined and its contents thoroughly dealt with; (2) free drainage from the antrum into the nose; (3) avoidance of the establishment of any lasting opening into the canine fossa, and hence no risk of re-infection from the mouth.

The Caldwell-Luc operation.—In addition to the usual preparations, the patient should have the nasal chamber on the same side cleared of any polypi which may be present, the mouth rendered as aseptic as possible, and the teeth put in good order. A general anæsthetic having been given, sponges are inserted into the post-nasal space (p. 85), the lip and cheek on the affected side are retracted, and a mouth-sponge is introduced between the last molars to absorb blood. The antrum is punctured from the nose, and well washed out (p. 258) so as to render the field of operation as aseptic as possible. An incision is made through the periosteum at a distance of a few millimetres from the gingivo-labial furrow (Fig. 141). The muco-periosteum is turned upwards and downwards with a blunt raspatory, and the canine fossa is then opened with chisel and hammer; the opening is sufficiently enlarged with bone-forceps (Figs. 154 and 155, p. 286) or burr to admit the operator's little finger. The opening should be made on a level with the alveolar floor of the sinus, and carried well forward so that it approaches closely to the nasal wall of the cavity. The margin of the orifice is kept as smooth as possible—by burr or bone-forceps—and any spicules of bone which are driven inwards should be removed. Care should be taken to avoid injury to the

* *Brit. Med. Journ.*, Dec. 15, 1894.

† *N.Y. Med. Journ.*, Nov. 4, 1893.

‡ *Soc. Franç. d'Otologie*, etc., Mai, 1894. "Leçons sur les Suppurations de l'Oreille Moyenne et des Cavités Accessoires des Fosses Nasales." Seconde édition, Paris, 1910.

infra-orbital branch of the trigeminus nerve, otherwise troublesome neuritis may be set up.* Bleeding, which may be very



Fig. 141.—The incision in the Caldwell-Luc operation upon the maxillary sinus. (From the author's article in *Burg-hard's "System of Operative Surgery."*)

free at first, is carefully stanch'd with ribbon gauze and adrenalin or peroxide; the walls are inspected with a frontal electric search-light, and all redundant or polypoid tissue is plucked away with punch-forceps (Figs. 78 and 114), or curetted with ring knives. (Fig. 142.) The mucosa should not be removed in a haphazard way, nor an attempt be made to denude the walls. The ethmoidal cells bordering the inner antral wall (*see* Figs. 117 and 119) should be broken down and plucked away so as to create an opening into the nose above the inferior turbinal.

Creation of a nasal opening.—The nasal cavity of the affected side is first well illuminated, and, if necessary, the anterior third of the inferior turbinal is amputated (*see* p. 135). This pro-

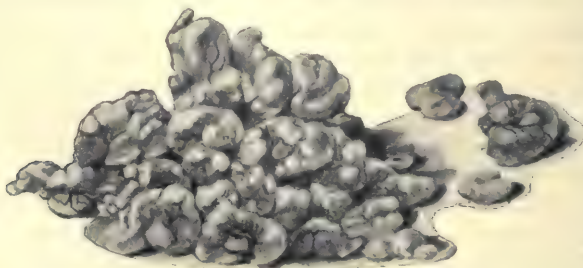


Fig. 142.—Life-size drawing of polypoid hypertrophies removed from a maxillary sinus.

* De Roaldes, *Trans. Amer. Laryngol. Assor.*, 1899.

ceeding may, with advantage, be carried out under cocaine some time before the major operation, or it can be done before the canine fossa has been opened. Turning now to the canine opening, the surgeon breaks through the partition between the antrum and nose with electric burr, or with hammer and chisel, working close to the antro-nasal floor, and well forward under cover of the detached portion of the inferior turbinal (Fig. 143). The probe-pointed trocar of a Krause cannula is useful for defining the opening, which should be enlarged backwards until most of the outer wall of the inferior meatus has been resected (Fig. 138, p. 266). Care must be taken to avoid injuring the septum.

The maxillary sinus is once more dried; any uncertain corners are inspected and the cavity is wiped out with sterile salt solution. No packing at all is used unless there is much bleeding, when a yard or so of ribbon gauze may be loosely tucked into the sinus, with the end led through the antro-nasal opening until it appears at the nostril. The muco-

periosteum reflected from the canine incision is carefully lifted back into position; the two flaps fall into complete coaptation, and there is no need to insert sutures. Sponges in the postnasal space or at the junction of the jaws are removed.

After-treatment.—There is seldom any reaction, but no alarm need be felt if the cheek on the same side becomes so swollen as partly to occlude the eye. A firm compress of cotton-wool, or hot fomentations, will relieve the feeling of distension. The diet should be fluid for a day or two, and swallowed through

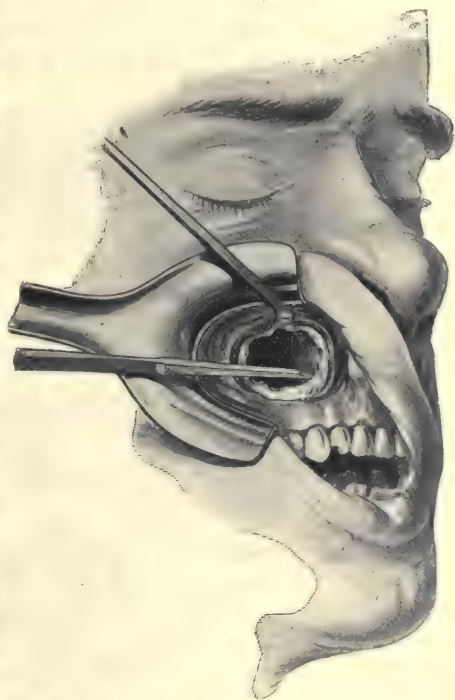


Fig. 143.—The Caldwell-Luc operation upon the maxillary sinus.

Breaking through the antro-nasal wall below the level of attachment of the inferior turbinal. The opening has been purposely represented coming too far forward in order to include the view of the antro-nasal wall. (From the author's article in Burghard's "System of Operative Surgery.")

the opposite corner of the mouth. The mouth may be rinsed out frequently with some cleansing alkaline lotion.

Any ribbon gauze plug is removed through the nose within twenty-four hours, and is not renewed. Except for the application of a little ointment to the nostril (Formula 74, p. 813), the nasal cavity should be left alone for four or five days. Then a cleansing lotion may be used a few times (Formulae 8 to 11, p. 801). The

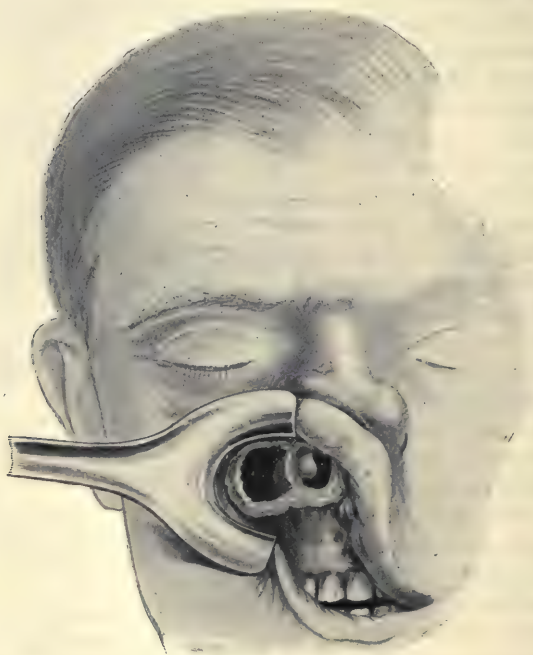


Fig. 144.—Denker's operation.

This is an operation for gaining access to the maxillary antrum and the lower part of the nasal cavity on the same side. The incision through the mucous membrane, and the steps of the operation, are a combination of the operations of Rouge and Caldwell-Luc. (*From the author's article in Burghard's "System of Operative Surgery."*)

large opening into the inferior meatus is sufficient for natural drainage, but it may be well to wash out the antrum occasionally from the nose, as directed on p. 265, for some weeks, until, after an interval of a few days, the lotion used returns clear. The mucus is apt to dry into crusts along the irregular border of the antro-nasal opening, but this disappears as the margins heal over. Further suggestions for after-treatment are given at p. 266; but the nose and sinus should not be too much handled: promising

cases which have been skilfully operated on do best when left alone. The cure is complete in three to six weeks.

Indications for treatment.—This operation entails no possibility of any disfigurement of the face, and it is so free from risks that complete and lasting arrest of suppuration may be expected in uncomplicated cases. It can be employed after the preceding methods have failed. It is the only available method for treating foreign bodies in the antrum.

Modifications.—If the inferior turbinal does not come so near the floor of the nose as to obstruct drainage, it may be left intact. The swabbing-out of the cavity with chloride of zinc (gr. lx to ʒi) or carbolic lotion (5 per cent.) is recommended by some surgeons, and also the insufflation of iodoform powder. The bucco-antral wound is sometimes closed by a couple of horse-hair or catgut sutures, but this seems uncalled for, unless from alveolar necrosis the edges of the wound fail to coapt.

The operation has been modified by Bœnninghaus, who saves the mucosa of the antro-nasal wall, so as to form a flap to turn down on the raw ridge. Denker has enlarged the opening in the canine fossa right forward into the nasal cavity, so as to do away with the invisible anterior angle of the antrum, and secure a clearer inspection of the depths of the maxillary cavity * (Fig. 144).

Summary of the methods of dealing with suppuration in the maxillary sinus, and indications for each.—It will be seen that the methods available may be tabulated as follows:—

1. Spontaneous resolution, aided by—

- (a) General hygiene.
- (b) Administration of drugs.
- (c) Topical applications.
- (d) Extraction of teeth.

These methods are only applicable in cases of recent infection.

2. Nasal lavage.

- (a) Through the ostium maxillare.
- (b) Through the antro-nasal wall.

The first of these plans is seldom practicable; the second is employed in recent cases which are obstinate, or which show signs of retention.

3. Buccal lavage.

- (a) Through the canine fossa.
- (b) Through a tooth socket.

* *Arch. f. Laryngol.*, xvii., ii.
Ann. des Mal. de l'Oreille, ii., Nov., 1906, p. 502.
 H. Stolte, *Laryngoscope*, March, 1906, p. 190.

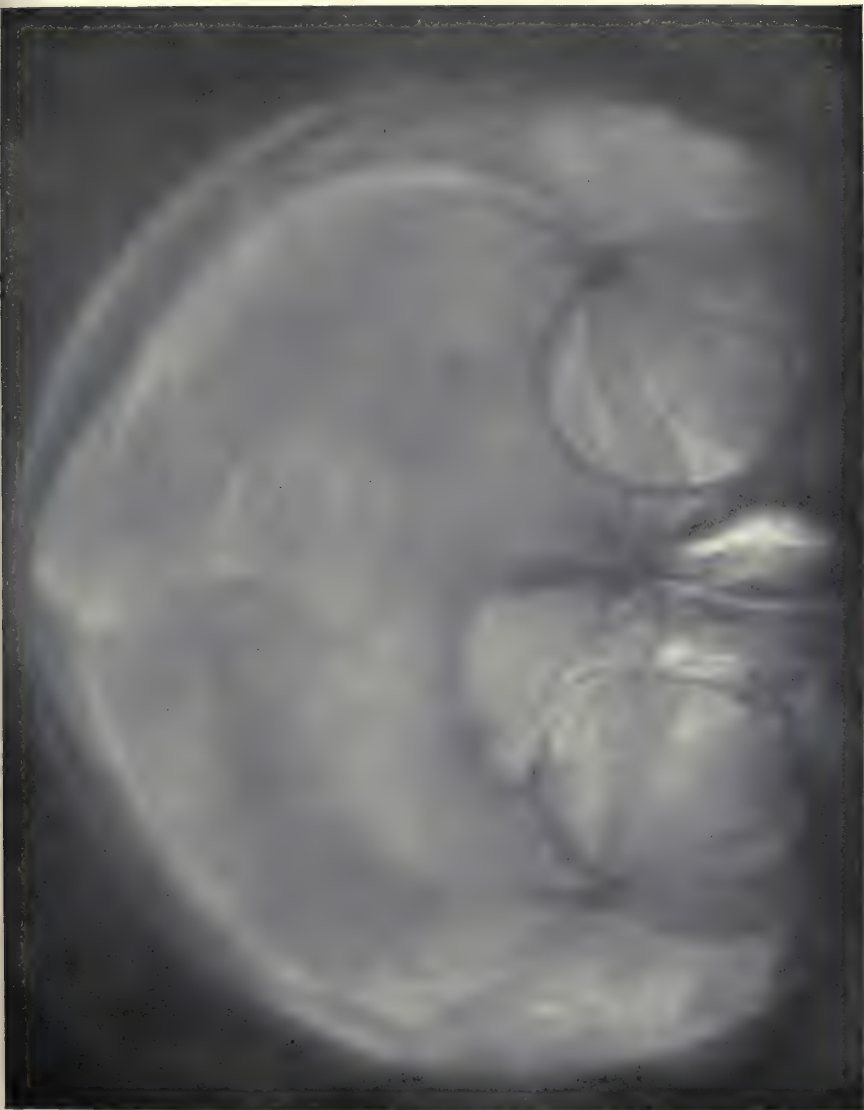
Only the latter of these routes requires consideration. It is not employed unless there is a suitable tooth-socket available. It can be used as a temporary measure of relief, and more permanently in those cases where age, disease, or circumstances do not permit of more promising operations.

4. **Operations through the antral walls.**—(a) By an opening through the canine fossa only. This procedure is now generally abandoned.

(b) By an opening through the antro-nasal wall only. This is now the usual operation in all chronic cases.

(c) By an opening through the canine fossa, and a second opening through the antro-nasal wall (Caldwell-Luc). This is reserved for more inveterate cases; for those in which the preceding operation has proved a failure; and for cases of foreign body.

(d) By the Caldwell-Luc operation as modified by Denker and Bøenninghaus. The technique of these operations is difficult, and they have not been generally adopted.



Chronic suppuration in the left frontal sinus. The obscurity and hazy outline of the diseased sinus is in striking contrast with the translucency and clear definition on the healthy (right) side.

CHAPTER XVI

CHRONIC SUPPURATION IN THE FRONTAL SINUS

Symptoms and diagnosis.—In the majority of cases of frontal sinusitis the subjective symptoms are those common to pus in any accessory cavity (p. 250), and there may not be any which point particularly to this sinus. In some instances, when the outflow of pus into the nose is obstructed, or acute exacerbations of the suppuration take place, we may get local symptoms of pain and tenderness which are frequently considered as merely "neuralgic," or there may be photophobia, redness, cedema, and swelling below the eyebrow, as in acute sinusitis. In all suspected cases it is well to note the presence of frontal pain or headache, and to test carefully the sensitiveness of the region, avoiding the supra-orbital nerve, and contrasting one side with the other.

A more or less constant headache, or feeling of oppression in the region of the sinus, is in some cases the symptom from which the patient begs to be relieved. But localized symptoms are no necessary part of chronic frontal sinusitis (Fig. 123, p. 252.)

Transillumination is of slight value. The lamp is fitted with a solid vulcanite cap, which permits of its being closely applied under the inner extremity of each supra-orbital arch, so that the translucency of the two sides can be compared. (Fig. 125, p. 256.)

Nasal examination.—The discovery of pus in the middle meatus should prepare the observer for finding that its source is the frontal or maxillary sinus, or both. If the pus is seen high up anteriorly, if it is accompanied by polypi, if it recurs rapidly when wiped away, if it flows more freely when the middle turbinal is pressed against the septum, and if there is no marked cacosmia, the evidence points to the probability of the upper cavity being the source. If, however, transillumination shows obscurity of the maxillary sinus on the same side, we should proceed to the following step.

Diagnosis by exclusion.—The maxillary sinus is first explored by one of the two methods already described—either by puncturing the inferior or middle meatus, or through an empty tooth-socket

(pp. 258 and 261). If the antrum is then washed out, we determine whether the cavity contains pus, and, if it does, we see that it is completely expelled. If we now wait for ten to twenty minutes, and, then, on examining the nose, again find pus in the middle meatus, we can be certain that this, in such a short time, can only have originated from the uncleansed frontal sinus or the anterior ethmoidal cells. If there is no recurrence of pus, then only the maxillary sinus is affected. If, again, no pus had been expelled on puncturing the latter, then the origin of the nasal pus is more certainly established in the frontal cavity. And, finally, if pus was expelled on syringing through the antrum, and yet recurs quickly in the middle meatus, we have shown that both cavities are affected.

Sounding the frontal sinus.—It is rarely possible to catheterize the frontal sinus in the healthy nose; but when the neighbourhood of the infundibulum has been broken down by polypoid growths and necrotic changes, it is frequently fairly easy. It is wiser to secure free access to the fronto-nasal duct by amputating the anterior end of the middle turbinal (p. 136, Figs. 76 and 77). This procedure will in any case be required as a method of treatment if, later on, the sinus is found affected. The sinus can then in many cases be catheterized, as described and figured below (Fig. 145).

Complications.—The most common complication is suppuration in the ethmoidal cells, revealed by the presence of polypi and pus in the area of the middle turbinal. It is exceptional in a case of any standing to find the frontal sinus affected without participation of the ethmoidal labyrinth. The pus not infrequently finds its way along the hiatus semilunaris until it reaches the ostium maxillare and trickles into the antrum. This cavity in its turn may then become infected, or it may simply act as a reservoir of pus which will cease to be found there as soon as the pyogenic process has been arrested in the higher sinuses.

TREATMENT

i. Intranasal treatment. i. **Puncture of the floor of the sinus.**—This method, suggested by Schaeffer,* is so dangerous that it is only mentioned to be condemned.

ii. **Catheterizing and washing-out the frontal sinus.**—Although, when the nasal chamber is healthy, it is extremely difficult to catheterize the frontal sinus, clinically we are able to succeed in passing a catheter into the sinus in more than half the cases we meet with. The reason of this difference is that in chronic frontal

* *Deutsch. med. Woch.*, Oct. 9, 1890, p. 905.



Radiogram showing the value of the Röntgen rays in rhinology. The cannula might be thought to have entered the frontal sinus, whereas the X-rays show that its point has only penetrated an ethmoidal cell. (Cf. Plate VIII.)

PLATE VII.

suppuration the ethmoid cells are almost invariably diseased, and the divisions between them are so friable that they easily break down under the pressure of the catheter. Also, in diseased conditions, the track of pus assists in guiding the catheter. In any case the approach is greatly facilitated by amputation of the anterior end of the middle turbinal (p. 136, Fig. 76), and, when the anterior ethmoid cells are diseased, by clearing them away (cf. pp. 280 and 281).

After the local use of cocaine and adrenalin, a silver cannula with a sigmoid curve—such as that of Hartmann (Fig. 145)—is

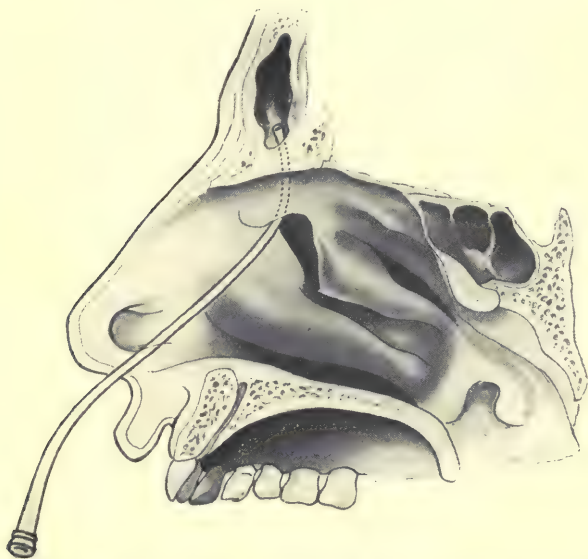


Fig. 145.—Method of catheterizing the frontal sinus after removal of the anterior end of the middle turbinal.

The drawing shows the hiatus semilunaris, with the edge of the processus uncinatus below it, and the ethmoidal bulla above.

introduced into the centre of the middle meatus, and gently passed upwards, forwards, and a little outwards, until the point is felt to enter a cavity. No force should ever be employed. By directing the beak of the instrument a little outwards the dangerous cribriform region is avoided. The curve of the instrument can be altered to suit the conditions met with. When the cavity has been entered, the visible part of the catheter should lie flat against the upper lip. If access to the fronto-nasal canal is impeded by a deviated septum, or if the latter interferes with

drainage, it may require correction by a submucous resection (*see* p. 270).

In some cases it is impossible to say whether the cannula has really entered the frontal sinus. A radiogram will settle this point, and should be made in all cases, as it will eventually be required to determine the size and extent of the sinus* (Plates VII. and VIII.).

When the cavity can be catheterized from the nose it should be washed out daily with liquids similar to those indicated for



Fig. 146.—Intranasal operation on the frontal sinus.

The probe indicates the natural channel and the posterior route followed by pus from the frontal sinus. The dotted line shows the shorter and more direct route obtained by operation. (*P. Watson Williams.*)

suppuration in the maxillary antrum (p. 258). A permanent cure is rarely effected by this treatment in a well-established case of chronic suppuration. In a case in which I was certain that the suppuration was not of more than four months' duration, intranasal treatment was a failure, although carried out most carefully on forty-four successive days.† The cause of failure is apparent whenever these sinuses come to be opened, for then it is generally found that the cavity itself is stuffed with fungating mucosa, and

* Spiess, *Journ. of Laryngol.*, Nov., 1899.

† *Proc. Roy. Soc. Med.*, Laryngol. Section, Dec., 1907.



Radiogram showing cannula in the frontal sinus. (Cf. Plate VII.)

PLATE VIII.

that the fronto-ethmoidal cells, where the lavage never penetrates, are affected in the same way.

Still, the treatment is indicated (1) as a first step in diagnosis and treatment, and (2) to diminish the risk of retention and decrease virulence in those cases where an external operation is not suitable, or is declined (p. 293). Unfortunately the technique is one that patients can rarely learn for themselves, and is, indeed, only acquired by special training.

2. The intranasal operation.—In recent years the intranasal route to the frontal sinus has made such progress that it

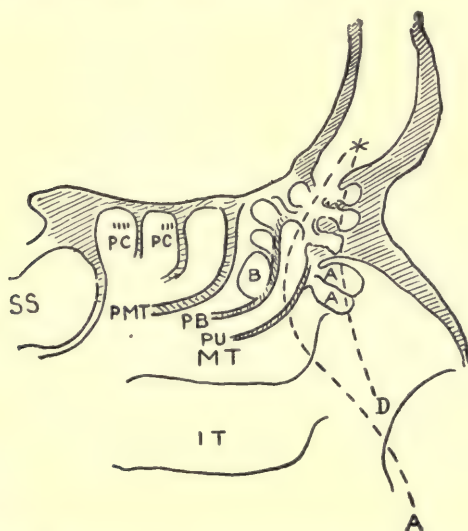


Fig. 147.—Intranasal route to the frontal sinus.

The dotted line A shows the natural, posterior and tortuous route of exit of pus from the cavity. The dotted line D shows the shorter and more direct route obtained by opening the agger cells A A; I T, inferior turbinal; M T, middle turbinal; P U, processus uncinatus; P B, plate of the ethmoidal bulla (B); P C, posterior ethmoidal cells; P M T, posterior end of the middle turbinal; S S, sphenoidal sinus. (*P. Watson Williams.*)

is now preferred whenever the external operation is not positively indicated. The latter, as will be described later on, is such a difficult and delicate operation, sometimes uncertain in its results, frequently alarming in its dangerous complications, and always associated with some facial scar, that it is performed much less frequently than it was when the first edition of this book was written.

Indications.—An endonasal operation for the relief or cure of frontal sinusitis may be employed in all chronic cases of more

extremities of the middle and superior turbinals (Fig. 149). This prominence corresponds to certain ethmoidal cells which have been called the agger nasi cells, or the anterior peri-infundibular cells, or Mosher's cells—after the rhinologist who particularly drew attention to their surgical importance.* (Figs. 147 and 148.) Firm pressure on this eminence with a sharp spoon, directed outwards, with a tendency downwards and backwards, will pass just behind the nasal process of the maxilla, and will enter a cavity bounded externally by the lachrymal bone, posteriorly by the bulla ethmoidalis, and superiorly by the frontal sinus. If the patient's head is held well extended this prominence comes better into view. If the curette does not sink

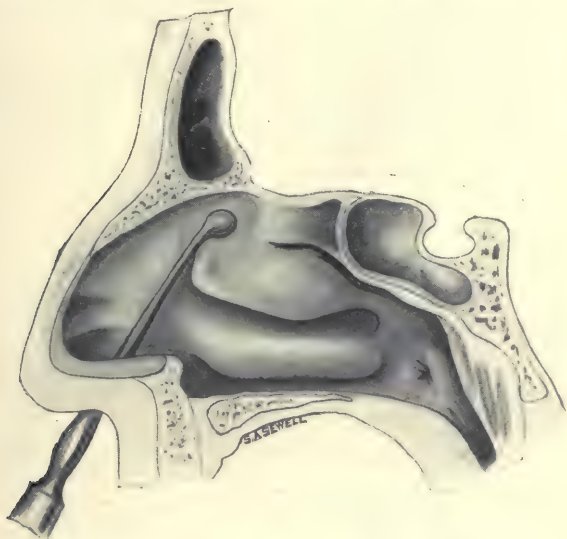


Fig. 149.—Opening the ethmoidal labyrinth.

Indicates the position where access may be gained to the anterior ethmoidal cells when the middle turbinal has not been previously removed. The sharp spoon is applied to the area where the agger cells can be best broken into. (Herbert Tilley.)

into this space at the first stroke, it must be applied a little higher and farther back. The instrument can then be felt to enter a cavity in which it should make sweeping movements from without downwards, inwards, and backwards, and during this part of the operation the head should be held vertical or even flexed a trifle forwards. In this way these agger cells are broken down, the bulla ethmoidalis is swept away, and the anterior ethmoidal labyrinth is eviscerated. The middle turbinal is apt to get partially detached and removed, but with a little care it can be preserved, if desired. The aditus of the frontal sinus region is next cleared by turning the curette forwards against the posterior border of the nasal process. A curved probe can now be

* H. P. Mosher, *Laryngoscope*, xxiii., Sept., 1913, p. 13; *Trans. Amer. Laryngol. Assoc.*, xxxiv., 1912, p. 25, and 1913; and *Amer. Med. Assoc. Trans.*, Laryngol. Section, 1914, p. 232.

passed through this more direct route to the frontal sinus, and it is further enlarged by sharp spoons, curettes, or raspatories on suitably curved shanks (Fig. 150). In all these movements the force should be directed forwards and outwards so as to avoid the roof of the frontal sinus above or the cribriform area internally. (Figs. 111 and 119.)

To open up the posterior ethmoidal cells and sphenoidal sinus, Mosher recommends that the head be held vertically, or even flexed slightly forwards, so as to avoid the chief danger of the operation, viz. entering the cranial cavity in the neighbourhood of the superior and outer extremity of the hindmost ethmoidal cell. This is best

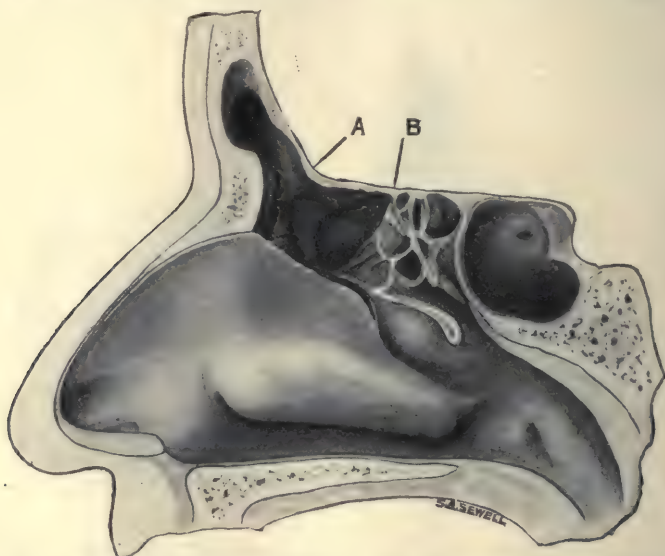


Fig. 150.—Intranasal operation on the frontal sinus: opening the ethmoidal labyrinth.

The area included between A and B indicates the ethmoidal region when the anterior group of cells has been removed. The nasal spine of the frontal bone has also been removed, (Herbert Tilley.)

avoided by carefully differentiating the front wall of the sphenoid, particularly the internal region, which forms the posterior part of the roof of the nose, and the external portion, which is in relation with the deep ethmoidal labyrinth. This line of demarcation is clearly defined by the posterior end of insertion of the superior turbinal. This is broken down in an inward direction, and the labyrinth cleared by introducing the curette carefully backwards and outwards, and then sweeping it forwards and inwards. The detached remains of the middle turbinal will, of course, have been cleared away in this approach. Finally, the sphenoidal sinus can be opened, as described at p. 302.

After-treatment.—No plug is left in the nose; a piece of sterile cotton-wool is loosely fixed in the nostril, and changed as it becomes



Radiogram showing the presence of only one frontal sinus. This was confirmed at operation, and the cavity was found to communicate with the right nasal chamber.

soiled ; otherwise the nasal cavity is best left alone for three days or longer. Then, as the reaction passes off, it can be cleansed with warm alkaline lotion so as to facilitate the expulsion of bloodclots, the removal of semidetached tags, and the syringing of the frontal sinus. This may have to be repeated every twenty-four or forty-eight hours for a few weeks, while the route is kept open by the passage of Ritter's frontal probes and applications of nitrate of silver (20-60 gr. to the ounce, i.e. 5-15 per cent.).

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 P. Watson-Williams, *Journ. of Laryngol.*, xxix., May, 1914, p. 221.
 Herbert Tilley, *ibid.*, p. 242.

3. **The external operation.**—i. At the present time the Killian operation is reserved for cases unrelieved by the endonasal operation just described, and for those complying with the indications mentioned on p. 293.

Preparation.—A radiogram is taken to indicate the size and extent of the frontal sinus, and prepare the surgeon for meeting with troublesome orbito-ethmoidal cells (Plates vi. and ix., facing pp. 274 and 282).

As the ethmoid is diseased in nearly all cases, it should be cleared away at previous sittings, under cocaine or chloroform (p. 280). Even when healthy, the anterior extremity of the middle turbinal should be amputated (p. 136). If the antrum is also suppurating and a suitable tooth-socket is available, the alveolus will have been drilled at one of these preliminary treatments. If the sphenoidal sinus is suppurating, its orifice will have been enlarged and the cavity treated (see p. 302).

One hour before the operation, strips of ribbon gauze, soaked in adrenalin with the addition of 5 per cent. cocaine, are carefully laid all over the mucous membrane of the nose on the affected side. The face, moustache, and beard are well purified. When the patient is under chloroform three pencils of tightly rolled cotton-wool are introduced into the nose—one along the middle meatus, a second in front of the inferior turbinal upwards towards the bridge of the nose, and the third in the inferior meatus. Sponges are inserted in the postnasal space (p. 85). There is no advantage in shaving off the eyebrow : it can be thoroughly purified ; it helps to locate the skin incision ; if removed, it takes some time to grow again, and may not then correspond in size with the eyebrow of the opposite side.

The skin incision is first defined by scratching through the cutis with the tip of the knife, and three or four cross-scratches are made (Fig. 151). The object of this is to ensure correct coaptation of the flaps afterwards, and so avoid one risk of disfigurement. The incision is then carried down through all the soft tissues till it meets the periosteum. The flaps are retracted a little upwards and downwards, while the free hæmorrhage is met with pressure-forceps.

The periosteum incisions are now carefully planned (Fig. 152). Starting again from the outer corner, the knife is drawn inwards parallel to, and slightly above, the upper margin of the supra-orbital arch; but, instead of curving round the inner end of the orbit, in the track of the skin incision, it is kept straight along under the upper flap, to end over the glabella. The periosteum can now be reflected from the front of the sinus, and pushed upwards with the skin. Next, the periosteum is carefully peeled off the ascending process of the superior maxilla, and turned down from the inner third of the bridge, exposing a triangular area of bone. The periosteum must be carefully preserved over the inner part of the bridge,



Fig. 151.—Killian's operation upon the frontal sinus.

Shows the skin incision, with the transverse scratches made to ensure correct coaptation of the flaps. (*From the author's article in Burghard's "System of Operative Surgery."*)

to avoid the risk of necrosis. The upper flap of soft parts, with the perichondrium, is well retracted up on the forehead. The radiogram will have given an idea of the extent to which the front wall of the sinus must be laid bare. With a chisel and hammer the sinus is opened at its inner extremity. The entry is generally announced by the bulging upwards of the blue, polypoid, pyogenic membrane into which the thin, white, delicate mucosa of the cavity has been converted. The anterior wall is now completely removed with hammer, chisel, and forceps. Those of Lombard, Horsley, Hajek, Jansen, Citelli (Figs 153, 154, and 155), or similar models, enable us carefully to bevel down the margins of the cavity as it slopes up on to the forehead.

The pyogenic membrane is carefully plucked away with a pair of Grünwald's forceps. I never find it necessary to curette the cavity, for this must always be a risky proceeding. Small pledgets of ribbon gauze, if gently rubbed along the surface and into the corners, will detach every scrap of diseased mucosa.

A thorough acquaintance with the surgical anatomy of the region is required to prepare the surgeon for encountering physiological abnormalities, and the regular use of radiography will save him from



Fig. 152.—Killian's operation upon the frontal sinus.

The thick lines indicate the incisions through the periosteum. (*From the author's article in Burghard's "System of Operative Surgery."*)

being taken by surprise. The septum separating the two frontal sinuses may be found to be defective. The opening through the eyebrow on one side may lead into a cavity communicating only with the nasal cavity of the opposite side, one sinus being very large and extending far beyond the middle line, while the other is quite small. Or only one frontal cavity may be present (Plate ix., facing p. 282).



Fig. 153.—Lombard's bone-forceps.

The next step is to make the opening below the bridge. The exposed surface of bone is cut through with a triangular chisel (Fig. 156, B). The opening is enlarged with bone-forceps until free access is obtained to the anterior ethmoidal cells. The pledgets of cotton-wool placed in

the nose at the beginning of the operation now come in to help as guides. The periosteum is further elevated from the lachrymal bone above its groove, from the orbital plate of the ethmoid as far back

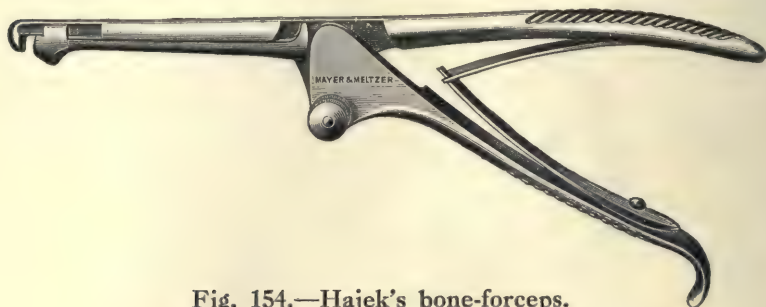


Fig. 154.—Hajak's bone-forceps.

as the anterior ethmoidal vessels, and from the orbital plate of the frontal bone below the bridge and extending outwards to the trochlear attachment and the supra-orbital notch. During this proceeding the contents of the orbit are protected from pressure by several folds of gauze, and are carefully retracted outwards by Killian's protector (Fig. 157). The area of bone which can now be clipped away comprises parts of the lachrymal, of the lamina papyracea, and of the floor of the frontal sinus. The whole of the floor of the sinus must be removed by working either from above the bridge or from below it. If this cannot be done without anxiety as regards the attachment of the pulley of the superior oblique, it is better to risk this than to leave pus-secreting pockets of orbito-ethmoidal cells in the roof of the orbit. But the pulley of the superior oblique should never be divided from its attachment to the rim of the orbit. It is much safer to reflect the periosteum farther outwards and downwards from the lower border of the

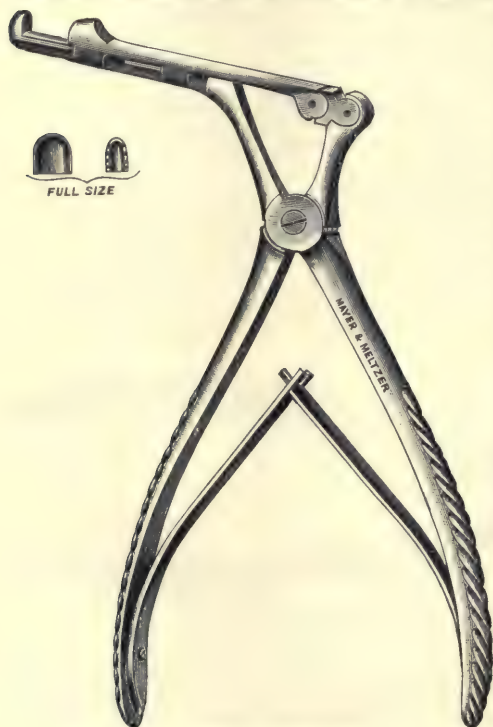


Fig. 155.—Citelli's bone-forceps.

Killian bridge. In doing this the pulley of the superior oblique may be detached with it. Any diplopia—most noticeable on looking downwards and outwards—is generally temporary, and, as a rule, it will disappear when the swelling subsides and the periosteum gets back to its anchorage. It may persist for one to six months.

It is this part of the operation which is the most delicate, tedious, and important. It is very common to meet with irregularities. The orbital recess of the frontal sinus itself may run back in the roof of the orbit nearly as far as the foramen opticum. One or two galleries may be met with in the roof of the orbit—prolongations of orbito-ethmoidal cells—passing outwards as far as the temporal end of the eyebrow, as indicated in Fig. 157. Their presence can only be revealed after removal of the floor of the frontal sinus proper, and in this way two or three bony dissepiments may have to be removed before the orbital fat rises, as it should do, to occupy the lower part of the exposed frontal sinus. In this part of the operation much help is obtained by the careful use of a probe, by frequently securing a field free from bleeding by pressure with adrenalin or peroxide, and by the knowledge

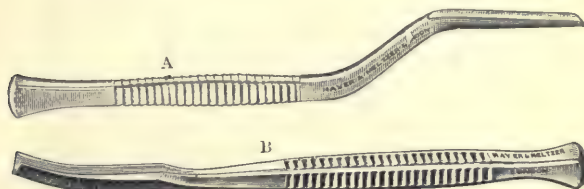


Fig. 156.—A, Killian's bayonet-shaped chisel; B, Killian's triangular curved chisel.

previously gained by skiagraphy. If the Röntgen rays have shown that the frontal sinus does not extend above the level of the bridge, or if radiography is not available and there is any uncertainty as to the extent of the cavity, this lower opening should be made first.

In the inner part of the large orifice which has been made below the bridge, the deeper ethmoid cells can be treated, and the sphenoidal ostium is much nearer than when viewed from the introitus narium, so that it is easy to enlarge it and deal with the contents.

The whole area of operation is next carefully cleansed with warm normal saline solution. Any projecting corners, or loose spicules of bone, are removed. If any point of pus should show up, it must be carefully followed to its source. The cotton-wool pledgets are removed from the nose. The pressure-forceps are twisted off, and any vessels that require it are ligatured. A strip of ribbon gauze is loosely packed in the lower part of the enlarged fronto-ethmoidal space, and the end is led down to the natural orifice. The flaps are brought together, and care is taken that the reflected periosteum is pulled back with them. Formerly Killian, in the majority of cases, used to sew up the whole wound at once. He now agrees that it is safer, in some cases, to leave the external angle with a small drainage-tube running inwards and downwards to the area of the fronto-ethmoidal cells. The inner part of the incision in the eyebrow, and all the part lying below the

bridge, can be closed. Killian employs aluminium-bronze wire, and a metal suture seems preferable, as the contamination of the wound-edges makes stitch-abscess not uncommon.

Secondary suture, on the second or third day, is reserved by Killian for cases when (*a*) the history or appearance of the mucosa indicates a recent exacerbation; (*b*) there is a history of erysipelas; (*c*) the pus is very fetid; (*d*) there is any history of a tendency to wound complications; or (*e*) there is marked invasion of the diploë in the frontal bone.



Fig. 157.—Killian's operation upon the frontal sinus.

The periosteum has been preserved on the bridge. Above this the frontal sinus is exposed; at its inner (nasal) extremity the frontal bulla is indicated, bulging up into the cavity. The periosteum lying above the bridge has been retracted up with the soft parts on to the forehead. Below the bridge is the opening to the ethmoidal region. The curved retractor is protecting the eyeball. (*From the author's article in Burghard's "System of Operative Surgery."*)

Double cyanide gauze, wrung out of boric lotion, and covered with a good supporting pad of cotton-wool, is then put on. But when there is any question of intracranial complication, when the pus is fetid or there is any necrosis, and when we are forced to operate during an acute exacerbation, it is better to apply warm boric fomentations and leave the upper part of the incision freely open.

Progress.—The patient is put to bed on the sound side, so as to assist drainage. He is advised not to blow the nose, but to hawk as much of the secretion as possible backwards and then expectorate it. The gauze drain is removed from the nose at the end of twenty-four hours, and is not renewed. If there is a drainage-tube at the

temporal end of the incision, it is changed after forty-eight hours, and is removed and cleansed daily. The dressing is also changed daily, after the first forty-eight hours, so as to keep a careful watch for any retention. I have been well satisfied with a graduated, conical compress, fixed on the forehead above the Killian bridge by an eye-bandage, so as to keep the soft parts of the forehead in close apposi-

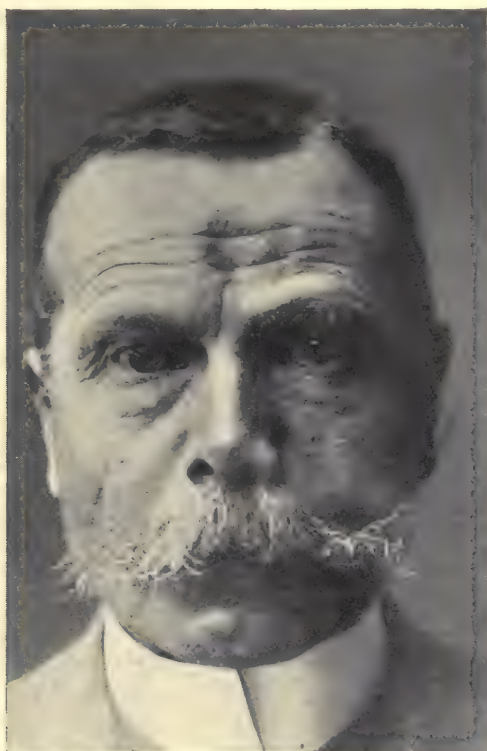


Fig. 158.—Radical operation for chronic left frontal sinus suppuration.

Untouched photograph of a patient one year after operation. There is very little disfigurement, although an extensive sinus had been exposed, extending as far as the outer extremity of the eyebrow, inwards across the middle line, and upwards on the forehead nearly to the hairy scalp. The scar of the wound through the eyebrow is scarcely visible. (*Proc. Roy. Soc. Med., Laryngol. Section*, vol. iii., No. 8, June, 1910, p. 144.)

tion with the posterior (cerebral) wall of what was the frontal sinus. On the fifth day the sutures can be removed, and soon afterwards the dressing can be discontinued and the eye left uncovered. A cleansing nose-lotion may be used, but much intranasal treatment should be avoided for a while. After one or two weeks any granulating surface up behind the bridge is painted occasionally with a 2-3 per cent. solution of nitrate of silver. Any crusts are removed after soaking with peroxide of hydrogen.

Results.—In uncomplicated cases, successfully operated on, the results are most satisfactory. Patients may sometimes be completely and permanently cured within a fortnight. The preservation of the Killian bridge quite prevents any really unpleasant disfigurement; the depression which may form above it is proportionate to the size and depth of the cavity. No man need decline the operation on account of the scar left (Figs. 158 and 159). In women we are able, with the help of a radiogram (Plates IV., VII., and IX.), to form an idea beforehand as to the



Fig. 159.—Operation for frontal sinus suppuration.

Profile view of the same case as shown in Fig. 158. This photograph shows the great depth of the diseased sinus, and of the depression resulting from the operation. Yet, thanks to the preservation of the orbital bridge, the disfigurement is very slight. A thin white line on the side of the nose is the only trace on the face of the incision illustrated in Fig. 151.

degree of depression which may be left (Fig. 160). This, if required, can be remedied by the injection of paraffin (p. 668); but, fortunately, the frontal sinus in women is not, as a rule, so deep as in men.

As regards cessation of purulent discharge, the result will depend on the extent of the sinus, the presence of complicated orbito-ethmoidal cells, and the skill of the operator. If the ethmoidal labyrinth has not been completely dealt with, one or two cells

may continue to secrete. It may be wiser to leave them alone. In very deep sinuses a "dead space" between the back of the Killian bridge and the posterior (cerebral) wall of the sinus remains unfilled, and may continue to secrete if not cicatrized over evenly. But, in any case, secretion is no longer pent up in the fronto-ethmoidal group of cells, and the patient is relieved of headache, depression, and other symptoms of septic absorption.



Fig. 160.—Frontal sinus suppuratation.

Extensive sinus, showing very slight trace left by radical operation. The patient left the hospital within fourteen days, and was completely relieved of every trace of suppuratation, and of the headache for which she begged relief by operation. Photograph taken eight months later. (*Proc. Roy. Soc. Med., Laryngol. Section, May, 1910.*)

Dangers.—Amongst the "untoward results" consequent on the external operation the following somewhat alarming list is given as occurring in as few as twenty cases: 1, œdema of eyelids; 2, paralysis of the upper lid; 3, continuation of the discharge; 4, fistula or abscess formation; 5, hemicranial anæsthesia; 6, neuralgia—(a) local, (b) hemicranial; 7, deformity—(a) sinking-in of

forehead, (b) contraction of scar, (c) falling-out of eyebrows, (d) excessive growth of eyebrows, (d) formation of cheloid; 8, formation of pneumatocele; 9, temporary and permanent diplopia; 10, blindness on operated side.*

The operation is not free from risk. Latent cerebral trouble connected with the sinus may be roused into activity by the local traumatism, however skilfully effected. The shock, or the lowered local resistance, may stimulate a latent infection in neighbouring sinuses, and also weaken the lines of defence protecting the cranial cavity.

In 1905 Logan Turner collected the record of 24 deaths which had occurred after operation on the frontal sinus.† This number has been exceeded by the fatalities since published, and the much greater number which have never been recorded.‡ The chief dangers are (1) a spreading septic osteo-myelitis, (2) meningitis, and (3) abscess in the frontal cerebral lobe.§

Infection of the bone is indicated chiefly by a puffy, tender swelling on the forehead or temple, adjoining the upper flap. There may be little or no rise of temperature, and little complaint on the part of the patient. If this does not yield in two or three days to hot fomentations and cleansing the interior of the nose, no time should be lost in laying the wound freely open, searching for any shut-off focus of pus, and applying hot boric fomentations. Once infection is established in the bone it may be impossible to stay its progress, even by the most thorough removal of diseased tissue, but the effort should be made and has been successful.||

* Ross Skillern, "Untoward Results following External Operation on the Frontal Sinus," *Laryngoscope*, xxiii., 1913, No. 11, p. 1063.

† Logan Turner, *Edin. Med. Journ.*, March, 1905.

‡ P. H. Gerber, "Die Komplikationen der Stirnhöhlenentzündungen." Berlin, 1907. von Eicken, "Unsere Erfahrungen über Komplikationen bei Erkrankungen der Nasennebenhöhlen." *Verhandlungen des Vereins deutsch. Laryngol.*, 1908.

Jacques, *Ann. des Mal. de l'Oreille*, xxxvi., i., Juin, 1910, No. 6, p. 610.

Sieur et Rouvillois, "Traitement Chirurgical des Antrites Frontales: Étude critique des accidents consécutifs," Soc. Franç. d'Oto-Laryngol., 1911; and *Ann. des Mal. de l'Oreille*, xxxvii., 1911, No. 5, p. 393.

§ H. Luc, "Complications Crâniennes et Intracrâniennes des Antrites Frontales Suppurées," *Ann. des Mal. de l'Oreille*, xxxv., i., 1909, No. 3, p. 265.

Hajek, "Two Cases of Death after Operation on the Frontal Sinus," *Rev. Heb. de Laryngol.*, xxx., ii., 1909, No. 40, p. 408.

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W. Freudenthal, "Die intrakraniellen Komplikationen nasalen Ursprungs," *Arch. f. Laryngol.*, Bd. xxii., Heft 3.

|| H. Tilley, *Lancet*, Aug. 19, 1899, p. 534; and *Edin. Med. Journ.*, March, 1905, in a paper by Logan Turner.

Charters Symonds, *Proc. Roy. Soc. Med.*, Laryngol. Sect., vol. iii., 1910, p. 40. Dan McKenzie, *Journ. of Laryngol.*, xxviii., 1913, No. 1, p. 6. (Full study and reference to all recorded cases of "Diffuse Osteomyelitis from Nasal Sinus Suppuration.")

W. G. Porter, *ibid.*, xxix., Feb., 1914, No. 2, p. 96.

Meningitis is an equally dangerous complication. It may arise without direct injury to the cerebral wall of the sinus.* If, during removal, the anterior end of the middle turbinal is damaged too high up, the lymph-channels around the olfactory nerve may be opened so freely that infection spreads along them to the meninges. In the same way, if there is any damage done to the sinus wall in the neighbourhood of the crista galli or cribriform plate, the dura mater is almost inevitably injured at the same time, and a rapid and fatal meningitis may be expected. The infection is generally streptococcal, and surgery is powerless to stop its progress. On the other hand, the cerebral wall may sometimes be broken through without a serious result if the dura mater is left intact behind it.

Abscess in the frontal cerebral lobe may arise from operation on the frontal sinus. In my experience it is still more apt to occur independently of interference with the sinus; to remain latent; and then to be simply roused into activity by the local traumatism. The symptoms are, unfortunately, very vague. The injection of bismuth-paste into the frontal sinus, followed by an X-ray examination, may assist in diagnosing a chronic abscess in the frontal cerebral lobe.† Rise of temperature, headache, irritability, drowsiness, and optic neuritis may be present. On the occurrence of these symptoms the sinus should be freely reopened, and the posterior (cerebral) wall carefully inspected for any necrosing area. In any case it should be removed, and the frontal lobe explored in all directions.‡

Doubtless the dangers have been diminished since the more general adoption of the Killian operation, but accidents will occur in the most skilful hands. In his first 86 cases Killian had no accident. But before the first 100 cases were completed he had 3 deaths, one after the other. The first was due to closing up the operation wound in a case where it might have been left open; the second to an overlooked maxillary sinusitis; and the third to a sphenoidal sinusitis which had not been recognized.§

Indications.—The indications for this operation are thus given by Killian: (1) Failure of other operations. (2) Presence of fistula or abscess, or indications of necrosis. (3) Symptoms of intracranial complications. (4) When, in a case of chronic purulent frontal sinusitis, there is pain and fever with a fetid discharge. (5) Persistent headache, particularly when associated with

* Jauquet, *Ann. des Mal. de l'Oreille*, xxxvi., ii., Juillet, 1910, No. 7, p. 51.

† Wilfrid Glegg, *Lancet*, 1915, i., Jan. 16, p. 124.

‡ See footnotes on p. 254.

§ Internat. Cong. of Rhino-Laryngol., Vienna, 1908.

discomfort in the region of the eye, and not relieved by intra-nasal treatment. (6) When the discharge from the sinus remains foul, in spite of repeated irrigations. (7) When recurring groups of polypi are produced by the suppuration in the frontal and ethmoidal cells. (8) When a simple purulent discharge is not relieved by careful intranasal treatment, and the patient desires permanent relief by radical operation.

The operation should only be undertaken by those with special training and intimate knowledge of the region affected, for we may still accept Lermoyez's dictum: "Avoir une sinusite chronique est chose moins grave qu'on ne croit; opérer une sinusite frontale est chose plus sérieuse qu'on ne le dit." *

ii. **Ogston-Luc operation.**—This operation was first described by Ogston, † but was independently conceived by Luc. ‡ Its principle is to make a fairly free opening into the frontal sinus, and then establish a large communication with the nasal cavity. The inner part of the supra-orbital rim is sometimes destroyed. But the operation does not provide for the treatment of orbito-ethmoidal cells, the anterior ethmoidal region and the sphenoidal wall are not exposed, and if there is a large orbital recess to the frontal sinus it cannot be satisfactorily dealt with.

Results.—These are variously given by different observers. Thus, one author states that it will effect a cure in 85 per cent. of cases, § while another operated by this method in 11 cases, of which 2 died, and not one was completely cured. ||

The subject does not require further discussion, as most operators, including Luc himself, have now given up this operation in favour of the improved one brought out by Killian. But the Ogston-Luc procedure, or some modification of it, is still suitable (1) in exploratory openings of the frontal sinus, (2) when the sinus requires opening for an acute infection ¶ (Fig. 121), and (3) for mucocèles and suppurating mucocèles ** (Fig. 166).

Operation.—A general anæsthetic is required. It is not necessary to shave the eyebrow, but the surrounding skin should be well purified. A curved incision is made through the eyebrow down to the bone along the inner third of the supra-orbital ridge, reaching from the supra-orbital notch to a point opposite the inner canthus. In the latter direction it can be extended if the ethmoidal region

* *Ann. des Mal. de l'Oreille*, xxx., i., 1904, No. 6, p. 579.

† Ogston, *Med. Chron.*, Dec., 1884.

‡ Luc, *Soc. Franç. d'Otologie*, Mai, 1896.

§ Lermoyez, *Ann. des Mal. de l'Oreille*, Nov., 1902.

|| Lack, *Edin. Med. Journ.*, June, 1902.

¶ StClair Thomson, *Practitioner*, July, 1906.

** Logan Turner, *Edin. Med. Journ.*, Nov. and Dec., 1907.

is chiefly affected ; and if the ethmoid only requires exposing, the incision is placed lower down.

With a raspatory the soft parts are turned upwards and downwards so as to expose the anterior wall of the sinus, which is opened with chisel and hammer. A probe will indicate its depth and direction. The opening is enlarged with bone-forceps sufficiently to allow inspection of the interior of the cavity, and permit of the passage into the nose being enlarged with forceps, curettes, or burrs. The polypoid mucosa occupying the sinus and the fronto-ethmoidal cells along the passage to the nose are carefully plucked away. A drainage-tube or wick of gauze is inserted from the sinus down into the cavity of the nose, so that it can be withdrawn from the anterior nares at the end of twenty-four hours. The drainage-tube is replaced by some surgeons. The frontal wound is sometimes closed at the time of the operation, and sometimes left open.

iii. **Kuhnt's operation.**—In this operation the entire anterior wall of the frontal sinus is chiselled away, so as to allow of the soft parts covering it being pressed down into the cavity until they are applied to the posterior wall. This, naturally, effects a complete obliteration of the cavity, but in order to secure it the orbital ridge has frequently to be removed to such an extent that a frog-like prominence is given to the eye, and the resulting disfigurement is very marked. Besides, this operation does not deal with the orbital recess of the sinus, or the orbito-ethmoidal cells—the most important part of the operation. In fact, the only advantage of this procedure—complete obliteration of the sinus—is as well secured by Killian's operation, which also allows these regions to be dealt with, permits free drainage into the nose, and avoids disfigurement.

CHAPTER XVII

SUPPURATION IN THE ETHMOIDAL CELLS AND THE SPHENOIDAL SINUS.

MULTISINUSITIS. MUCOCELE.

ASPERGILLOSIS, TUMOURS, FOREIGN BODIES, AND TUBERCULOSIS OF THE ACCESSORY SINUSES

SUPPURATION IN THE ETHMOIDAL CELLS

Synonym.—*Ethmoidal sinusitis.*

Etiology.—The direct exposure of the ethmoid to the respiratory air (Fig. 6, p. 6), and its complicated anatomical arrangements, explain the frequency with which suppuration is encountered in the ethmoidal labyrinth (Figs. 119, 130, and 132). Infection in the majority of cases is probably a primary one, for we often get pus in the ethmoidal cells without encountering it in the frontal or maxillary cavities. These latter are secondarily affected in many cases.

Symptoms.—These can be studied according as the suppuration affects the anterior or the posterior ethmoidal cells.

Anterior ethmoidal cells.—Adopting the classification of Grünwald, we may divide suppuration in these cavities into (a) closed suppuration, and (b) open suppuration.

(a) *Closed suppuration.*—If the orifice of a cell is closed by inflammation and its cavity distended with suppuration, there will be symptoms of obstruction and distension referable to the nose, forehead, or orbit. Inspection of the nasal chamber will reveal a cystic dilatation of the middle turbinal, although its true nature is seldom ascertained until it is punctured and cut across (Fig. 161). The contained pus may be strikingly fetid.* The circumscribed ethmoidal empyema should be removed with snare, forceps, and curette (Figs. 76, 77, and 78). When it points towards the orbit the swelling may have to be dealt with by external incision, but communication with the nose should be established as soon as possible.

* J. Payson Clark, "Bullous Enlargement of the Middle Turbinate Bone," *Trans. Amer. Laryngol. Assoc.*, xxiv., 1901, p. 134.



Radiogram of the left sphenoidal sinus. The beak of the forceps is in a large posterior ethmoidal cell, and is pressing against the anterior wall of a large sphenoidal sinus. (Cf. Plate XI.)

(b) *Open, latent or manifest empyema*.—This is the more common form. It is frequently overlooked in the accompanying nasal polypi or atrophic rhinitis, which are but two of the consequences, although they are often the most prominent symptoms. The symptoms will vary greatly according to the size, situation, and number of cells affected, and the nature, intensity, and duration of the suppuration. Faceache, neuralgia, mental hebetude, depres-

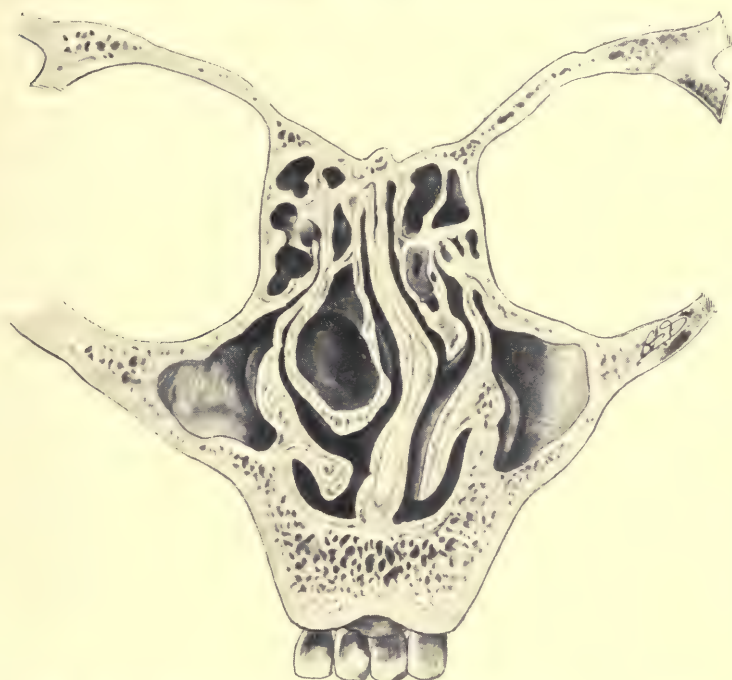


Fig. 161.—Bony cyst of the left middle turbinal. (After Zuckerkandl.)

sion, and melancholia may be among the general symptoms complained of. The local ones are chiefly those of nasal catarrh and obstruction, with frequent "cold-catching."

The discharge from the nose may consist of tenacious or inspissated mucus, muco-pus, or of crusts. It is seldom so copious as from the other sinuses, and cacosmia is rare. Some anosmia is more often complained of. Although the patient may use fewer handkerchiefs, he often has greater difficulty in clearing the nose owing to the drying of the secretion. In cases of turbinal atrophy the secretion may tend to be inspired towards the back of the nose,

and so, in some cases, to present itself in the form of atrophic, crusty, postnasal catarrh.

Examination will reveal pus in the middle meatus. In many cases it is accompanied by polypi, and it is in such instances that the pus is fluid and yellow. In other cases—generally when there is no tendency to polypus formation—the pus tends to dry into adherent greenish-yellow crusts, the epithelium gets eroded, and the turbinals atrophy, so that the appearances resemble those described under the heading of Ozaena. Careful use of a blunt probe will in certain cases reveal carious bone. Tenderness may be elicited by pressure over the lachrymal bone.

The **diagnosis** of ethmoiditis can also be arrived at by a process of exclusion. In all cases it is a good routine plan to begin by determining whether the maxillary sinus is affected (p. 255). Once this is settled, the frontal sinus may require exploration (p. 276), and to carry this out there need be no hesitation in removing the anterior extremity of the middle turbinal, for it would be the first step required in initiating treatment of frontal or ethmoidal suppuration. If pus is seen recurring in the middle meatus of the nose, after exclusion of the maxillary and frontal sinuses, then its origin is in the anterior ethmoidal cells. It must be remembered that ethmoiditis is a frequent concomitant of frontal or maxillary sinusitis, or of both.

The *posterior ethmoidal cells* open into the fronto-ethmoidal recess, above the level of the middle turbinal (*see* Fig. III, p. 226). Hence pus from these cavities may appear anteriorly in the olfactory cleft, or posteriorly in the roof of the choana, or in the naso-pharynx. Some of these cells may be of considerable size. Suppuration in them is frequently associated with pus in the sphenoidal sinus.

The symptoms complained of when the posterior ethmoidal cells are affected are generally obstruction and postnasal catarrh (p. 356). Orbital, ocular, and cranial complications may occur.

Treatment.—Ethmoiditis affecting the anterior group of cells can be dealt with intranasally, either under cocaine or chloroform, as described at p. 280 (*cf.* Figs. 146-50, pp. 278-82). The section on the treatment of nasal polypi should also be consulted (p. 231). In this way nearly all the cells can be reached. Those mounting up into the floor of the frontal sinus, or running outwards above the eye (fronto-ethmoidal and orbito-ethmoidal cells), might sometimes require an external operation, as in Killian's frontal sinus operation (p. 283). It is impossible to reach the posterior cells until the middle turbinal has been removed (p. 136), or all diseased cells in the anterior group have been broken down.

Prognosis of treatment.—In many cases the whole of a diseased ethmoidal labyrinth can be completely removed, with cessation of all local symptoms and restoration of general health. But prognosis should be guarded as to (a) the possibility of effecting this at one sitting; (b) the question of other cavities requiring treatment afterwards; and (c) the likelihood of the patient still having some nasal suppuration.

Free hæmorrhage, or, if under cocaine, any collapse of the patient, may prevent completion of an operation. Also, it is wise not to attempt much without seeing the pus and polypi which indicate the cells still diseased.

In some cases it is only after the complete removal of the diseased ethmoid that it is possible to determine the presence of pus in the sphenoid or frontal. On the other hand, symptoms in these sinuses may disappear, once the removal of the ethmoid permits of free drainage.

A study of anatomical sections will show that in some cases it is almost impossible to open the highest ethmoidal cells without a perilous approach to the cranial cavity (cf. Figs. 116, 119, and 120). Some patients may therefore have to resign themselves to some discharge and a daily douche. Vaccine treatment is considered on p. 248.

Dangers.—Slight degrees of ethmoiditis are common, and need cause no anxiety, although they conduce to catarrh, "cold-catching," and other discomforts. Well-established suppuration is apt to be a focus of infection to other cavities, and a possible cause of danger to the contents of the orbit or the cranium.

The dangers of operation have been described in the chapter on the treatment of ethmoidal polypi (p. 236). Even when no traumatic injury of the roof of the nose has taken place, virulent streptococci may travel by the anastomosis of veins between the labyrinth and the dura mater, setting up a fatal meningitis.*

CHRONIC SUPPURATION OF THE SPHENOIDAL SINUS

Etiology.—This is similar to that of suppuration in the cavities we have already studied (*see* p. 250). The position of the ostium is very unfavourable for drainage, and possibly explains why in many cases the secretion, on overflowing into the nose, is apt to dry into crusts and be mistaken for ozæna (Fig. 162).

Symptoms.—These may be referred to (a) the head, (b) the discharge, or (c) the eyes.

* Hajek, *Arch. f. Laryngol.*, Bd. xviii., Heft 2 (abstract in *Ann. des Mal. de l'Oreille*, xxxiii., ii., 1907, No. 11, p. 531).

(a) While some patients make no complaint of headache, others seek relief only because of pain, which may be diffused, or referred to the forehead, occiput, temples, ears, or deeply behind the eyes.

(b) It is important to remember that nasal discharge of any kind may be positively denied by many patients, in whom it is slight in amount and runs entirely backwards. Not only so, but actually no pus may be discoverable by the most expert rhinologist, although the sinuses may be found, on opening them, or post mortem, to be filled with pus and granulation tissue.*

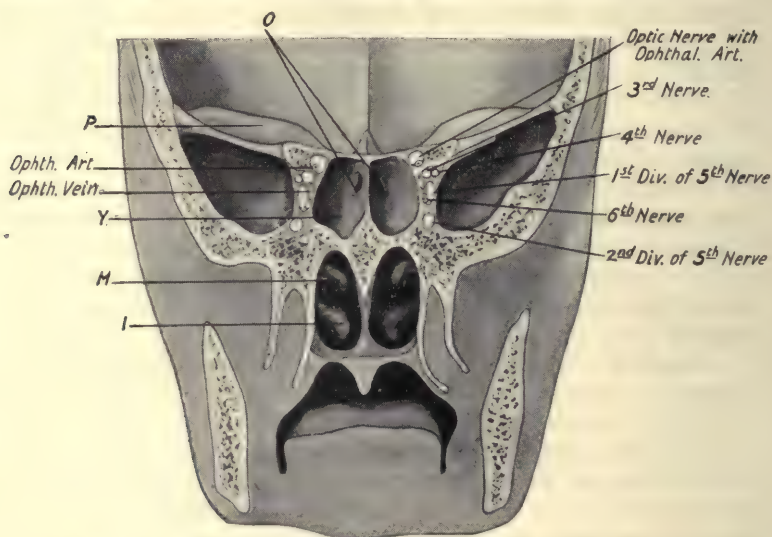


Fig. 162.—Surgical anatomy of the sphenoidal sinus.

Frozen section of anterior half of head, cut immediately in front of chiasma. Viewed from behind. *P*, orbital roof of frontal sinus; *O*, ostium sphenoidale; *Y*, left sphenoidal cavity; *M*, *I*, middle and inferior turbinals. (C. R. Holmes.)

Doubtless the explanation of this is that the outpouring of pus from the sinus may be intermittent, and that in many cases it is difficult to sound and wash out the cavity without a preliminary operation on the middle turbinal.

But the most common symptom is that of more or less purulent catarrh, frequently postnasal. (Plate III., Fig. 3, facing p. 124.)

Cacosmia may be complained of, and in advanced cases the sense of smell is more or less lost.

* Beck, *Rev. Heb. de Laryngol.*, 1903, No. 35, p. 265.

Toubert, *Arch. Gén. de Méd.*, clxxvi., 1900, p. 385.

Bronner, *Brit. Med. Journ.*, No. 12, 1904.

C. R. Holmes, *Arch. of Ophthalmol.*, xxv., 1896, p. 460.

(c) Eye symptoms are chiefly met with in advanced stages, but they may be the first to attract attention. Among them are lachrymation, photophobia, blepharospasm, and transitory scotoma. Retrobulbar neuritis with complete blindness, and such developments as thrombosis of the cavernous sinus and basal meningitis, should properly be classified as complications of the disease. (See p. 251 and footnote on p. 254.)

Examination.—In some cases the pus will be seen anteriorly in the olfactory cleft, and its detection here is facilitated by a thorough application of cocaine and the use of Killian's long nasal speculum (Fig. 18, p. 23). If a probe is inserted inwards and

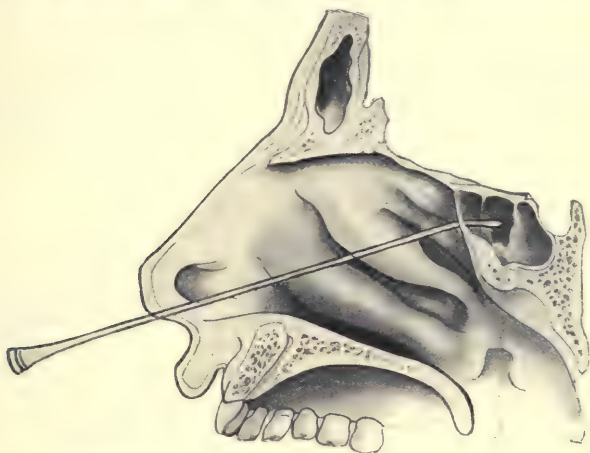


Fig. 163.—Method of catheterizing the sphenoidal sinus.

upwards diagonally across the plane of the middle turbinal it will impinge on the anterior surface of the sphenoid in the region of the ostium (Fig. 163). This opening has been found catheterizable in only 40 per cent. of cases.* In the remaining cases complete investigation is facilitated by removal of the middle turbinal (p. 136).

Even when rendered accessible, the natural orifice of the sphenoidal sinus is seldom distinctly visible, being closed by folds of mucous membrane much like the meatus urinarius. The distance from the anterior nares to the sphenoidal ostium has been found by various authors to vary between $2\frac{1}{2}$ and $3\frac{1}{4}$ inches, and a probe impinging on the posterior wall of the sinus has been found to be $6\frac{1}{4}$ inches from the tip of the nose. The anatomical

* C. R. Holmes, *Arch. of Ophthalmol.*, xxv., 1896, p. 461.

variations in the size and shape of the sinus are so considerable that it is unwise to rely on any measurements.

Dried scabs producing atrophic pharyngitis may be found coating the pharynx and postnasal space, or even adhering to the larynx or trachea (*see* Ozæna of the Larynx and Trachea, p. 144). They may be found on the back of the soft palate, and hanging about the choanæ (Plate III., Fig. 3, facing p. 124). On clearing them away, and in cases where the discharge is more fluid, thick muco-pus may be seen posteriorly flowing from the superior meatus of the nose, across the roof of the choana, and on to the nasopharynx. The catheterizing of the sinus, followed by the expulsion of pus or muco-pus (as carried out in the case of the maxillary and frontal cavities, pp. 258 and 276), is an imperative proceeding, not only in the establishment of the diagnosis, but as a preliminary to any treatment. The sinuses are so irregular in both size and contour that it would be rash to attempt to break into one without first ascertaining its configuration, either by a probe through the ostium or by the information afforded by a radiogram (Plates x. and xi., facing pp. 296 and 302).

Treatment.—Relief to the symptoms of nasal or postnasal catarrh may be obtained by ordinary cleansing measures (p. 56), followed by an oily spray to lubricate the passages (p. 61). The dryness of the pharynx may be relieved by a carbolic or other lozenge (Formulæ 43 and 46).

When more active treatment is called for, access to the front wall of the sinus is first secured by removal of the middle turbinal (p. 136), or by clearing away the ethmoid, which is frequently diseased in cases of sphenoidal suppuration (p. 280). This may be done at one or more sittings under cocaine or under a general anæsthetic. Then, by inserting a small ring knife, a sharp spoon, or the tip of a Grünwald forceps into the ostium, and using a screwing or boring movement, the orifice is sufficiently enlarged to admit suitable punch-forceps (Fig. 164), with which a good part of the front wall is cut away. This should be done freely, as the enlarged opening tends to contract afterwards. A chisel or electric burr can also be used by the expert. Care must be taken that the instrument does not plunge suddenly into the sinus and injure the posterior wall or the delicate roof.

The cavity can now be freely syringed out with warm saline solution, gently dried by packing in a strip of 1-inch ribbon gauze, and then carefully inspected. Any polypoid hypertrophies which present may be plucked away, but to attempt curettage of the lining membrane is both dangerous and unnecessary. If a good opening has been made to allow of free drainage and ventilation,



Radiogram of the left sphenoidal sinus. The beak of a pair of punch-forceps has penetrated the anterior wall of the sphenoidal sinus, and is seen in contact with the roof of the cavity, on the under surface of the sella turcica. (Cf. Plate X.)

the above cleansing measures only require to be supplemented by occasional painting out with argyrol (25 per cent.), nitrate of silver (2-5 per cent.), or similar astringent, to secure a good result in nearly all cases. Cure is sometimes hastened by packing the cavity for twelve or twenty-four hours with a strip of iodoform gauze.

Other methods.—The anterior wall of the sphenoidal sinus is sometimes broken through whilst punching away the posterior ethmoidal cells, as described on p. 233.* It can be entered during the Killian operation on the fronto-ethmoidal cells.

Results.—Complete cessation of suppuration and relief to all symptoms can be obtained in nearly all cases. The treatment of this cavity, once looked upon as quite beyond the reach of surgery, and till recently regarded as fraught with much danger

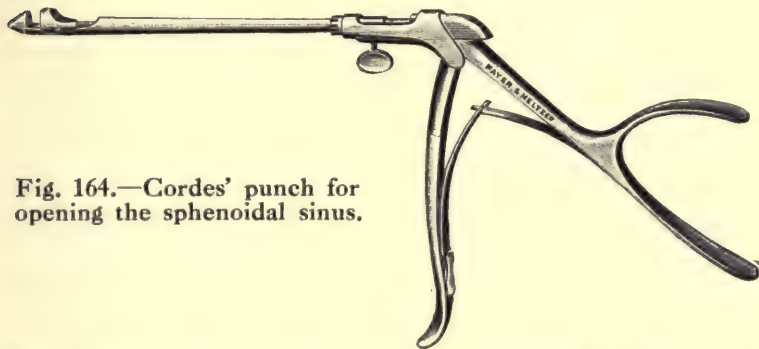


Fig. 164.—Cordes' punch for opening the sphenoidal sinus.

and difficulty, yields perhaps more satisfactory results than that of any other sinus.† Unfortunately the technique requires special training, skill, and practice. The important point for the general physician is to be prepared to suspect suppuration in the sphenoidal sinus.

Indications.—Profuse or troublesome catarrh, persistent headache, ocular or intracranial symptoms, call at once for treatment. Some cases of multisinusitis remain incompletely cured, and are apt to be reinfected unless this cavity also is dealt with.

MULTISINUSITIS

Combined cases of chronic suppuration in two or more accessory nasal cavities require special consideration.

Frequency.—It is not infrequent to meet with a chronic

* Luc, *Trans. Amer. Laryngol. Assoc.*, 1903.

† StClair Thomson, *Proc. Roy. Soc. Med.*, Laryngol. Section, i., 1903, p. 127; and vol. v., June, 1912, p. 167.

W. S. Syme, *Lancet*, Feb. 12, 1910.

suppuration limited to a single accessory sinus. Such a pyogenic focus may form a centre from which an acute infection will, from time to time, spread to other cavities. In exacerbations of a chronic condition it is therefore well to wait and see whether these fresh inflammatory conditions will not subside under general treatment, as they frequently will do.

But it is not uncommon to meet with pus in two or more of the accessory cavities, when the condition is often described as a *multisinusitis*. If all the cavities are infected it is called a *pan-sinusitis*, unilateral or bilateral.

The maxillary sinus is more frequently affected alone than is the frontal. The explanation of this is that the pus from the higher cavity trickles along the depth of the hiatus semilunaris until it reaches the ostium maxillare and enters the antrum. But the latter cavity is not necessarily infected, even then, by the presence of pus; it may only act as a reservoir, and pus may spontaneously disappear from it as soon as the higher cavity has been cured.

Ethmoidal suppuration may exist alone, but is frequently associated with maxillary or frontal sinusitis, or both. It is very rare to find a chronic frontal suppuration without disease in the ethmoidal cells, especially those bordering the floor of the sinus and the roof of the orbit.

Sphenoidal suppuration may be solitary, but it is frequently associated with pus in the ethmoid, and also in other sinuses.

Diagnosis.—When pus is found anteriorly in the middle meatus of the nose, attention will be directed to the anterior group of sinuses—i.e. the maxillary, frontal, and ethmoid—and a diagnosis arrived at by the methods of detection and exclusion described on pp. 254 and 275. It is safer to begin by settling the condition of the maxillary sinus (Fig. 165).

Pus appearing anteriorly in the olfactory cleft will direct attention to the posterior group of sinuses, i.e. the posterior ethmoidal cells and the sphenoidal sinus (pp. 298 and 299). But it is well to remember that pus in this cleft may also originate from the middle meatus, whence it is drawn upwards by sniffing or by capillary attraction.

The appearance of pus in the roof of the choana or the postnasal space will always direct attention to the possibility of suppuration in the sphenoidal sinus or posterior ethmoidal cells.

Pus seen posteriorly above the inferior turbinal or on the floor of the choana may come from the anterior group of sinuses. It is important to remember that the pus from a freely secreting

maxillary or frontal sinus, or both, may pass entirely backwards. A patient with such a condition may complain only of postnasal catarrh, and say he never requires a pocket-handkerchief. Or he may be so insensitive, or so habituated to the chronic ingestion of pus, that he disclaims any local discomfort.

Absence of nasal pus must not be looked upon as indicating freedom of the sinuses from suppuration. The discharge of pus from a sinus may be so slight and may occur at such long intervals that it never comes under notice, even in a case in which alarming orbital or cerebral complications are due to it.*

Hence, in any suspected case, transillumination, puncture and lavage of the maxillary sinus, sounding the sphenoidal sinus, and radiography, or exploratory opening of the frontal sinus, may be required. It may here be mentioned that when a healthy frontal sinus is opened, the mucous lining is white and glistening like the inside of an oyster, and so thin and closely adherent to the subjacent bone that all the irregularities of the latter are seen shining through.

The presence of polypi and pus, or a history of recurring polypi, is very suggestive of chronic disease in the ethmoid, frontal, or maxillary cavities.

Suspected cases, in which pus in the nose is not readily discoverable, should be seen during the morning hours and before the patients have cleansed, or even blown, the nose. The location and exit of pus may thus be more easily verified. A complete and correct diagnosis is sometimes impossible at the first visit; some of the sinuses may appear clear one day, or at certain hours, and yet be found to be yielding pus on another occasion. On the other hand, several cavities may at first appear to be incriminated: and later on it may be found that while some of them are affected

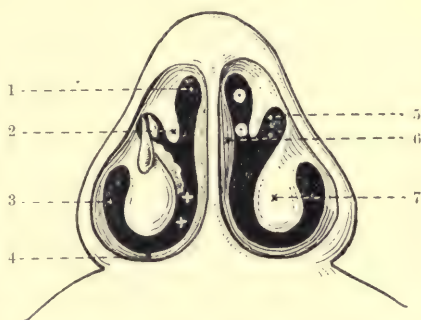


Fig. 165.—Diagnosis of nasal suppuration (semi-diagrammatic transverse section of nose).

1, Olfactory cleft; 2, middle turbinal; 3, inferior meatus; 4, floor of nose; 5, middle meatus; 6, septum; 7, inferior turbinal. On left side of drawing is indicated the usual site of polypi and of pus coming from the maxillary sinus. The stars (* *) on the left side of drawing indicate the usual position of pus coming from the anterior group of sinuses; the white spots on the right side indicate the descent of pus from the posterior group of sinuses (i.e. sphenoidal sinus and posterior ethmoidal cells).

* Jonathan Wright, *Laryngoscope*, xii., Feb., 1902, p. 120.

with chronic suppuration, others are only temporarily infected. Also, when some of the sinuses are successfully treated, the mischief in the remaining ones may disappear; though, on the other hand, the arrest of pus in some of the anterior sinuses, occasionally, only makes it clear that it still comes from other unsuspected cavities. Puncture and lavage of the maxillary sinus is such a simple proceeding, and gives such definite information, that it should be employed in all suspected cases, and on both sides, even though they happen to be clear on transillumination.

The diagnosis should be as complete as possible before surgical measures are embarked on.

Prognosis.—This has been dealt with when considering the several sinuses separately. Combined cases add considerably to the risks of the patient, whether left alone or operated on.

Treatment.—We have to decide (1) whether the age and general health of the patient permit of operative treatment; (2) whether this treatment should be palliative or radical; and (3) the order in which operative procedures should be carried out.

The first two points have to some extent been considered when studying the individual sinuses. In cases of multisinusitis it is well to recollect that treatment may be prolonged, that more than one operation may be required, and that prognosis as to the duration of the treatment is uncertain. Hence such cases are apt to make great demands on the time and patience both of the patient and of the surgeon. Again, while the patients in certain circumstances may be able to meet a prolonged treatment, or to put up with a condition which they can themselves relieve by daily attention, others may be so placed that they demand a complete cure, and as speedily as possible.

As to the order of procedure: When the anterior group of sinuses is involved, the ethmoid first demands attention. Then, if either the maxillary or frontal sinus is involved, the cavity is treated at a subsequent operation. If both are diseased, the frontal sinus first demands attention, while at the same time an intranasal operation is carried out on the maxillary cavity, or it is drained through an empty tooth-socket. It will sometimes cease to secrete pus when the discharge from the higher sinus has been arrested.

If the sphenoidal sinus is suppurating it should be treated at the same time as the ethmoidal, i.e. operation on the ethmoid and sphenoid should take precedence, and the frontal and maxillary sinuses should afterwards be operated on, and at the same time.

MUCOCELE OF THE ACCESSORY SINUSES

Synonyms.—*Chronic catarrhal sinusitis* ; *serous sinusitis*. When the maxillary sinus is affected—*dropsy of the antrum* ; *cysts of the antrum* ; *hydrops antri* ; *hydrops inflammatorius*.

A mucocele is a distension of one or more walls of an accessory sinus, and an accumulation within it of a mucous secretion. This secretion may be loculated in one part of the sinus, and may become purulent. It is generally associated with more or less complete obstruction in the outlet of the cavity, and it may be caused by blockage and cystic dilatation of a gland.

Situation.—Mucoceles are met with most commonly in the frontal sinus and the ethmoidal labyrinth. The antrum is rarely distended. There is only one recorded instance of the sphenoidal sinus being affected. In this case it caused optic neuritis, which completely subsided on treatment of the mucocele.*

Symptoms.—A swelling in the orbital region is usually the first thing to attract the patient's attention, and, as vision may also be interfered with, many of these patients first consult an oculist. The skin over the swelling is unaltered, and there is no inflammation, pain, or local tenderness, unless the cavity becomes pus-infected. Some patients complain of a dull, heavy, aching sensation. The swelling is situated in the inner third of the upper eyelid, immediately above the inner canthus, but it may extend along the upper eyelid, or involve the forehead and the root of the nose. On palpation, the swelling is soft, elastic, or semi-fluctuating ; sometimes parchment-like or egg-shell crackling can be elicited ; and a bony edge may be felt around the central portion when this has been absorbed. The eyeball, in many cases, is displaced forwards, downwards, and outwards, but its movements are rarely affected. Diplopia may be present, but the fundus is normal. Epiphora may be an early symptom of mucocele (Fig. 166).

Examination of the nose may prove negative, although the patient sometimes gives a history of discharge, or still complains of occasional unilateral catarrh. Or there may be mucus and occasional muco-pus in the nostril of the affected side. In some cases there is bulging of the outer wall of the middle meatus into the nasal cavity ; and on opening the ethmoidal cells there may be escape of mucoid, viscid, or purulent fluid, after which the external swelling diminishes.

In *hydrops antri* there is a gradual, painless distension of the cavity until the walls of the sinus are so thinned that under the

* M. Hajek, *Monatsschr. f. Ohrenheilk.*, xliv., No. 3.

finger they "crackle like strong parchment."* The walls may yield, so that the hard palate is flattened and the nostril becomes occluded. Sometimes the external wall is absorbed to such thinness that fluctuation is readily perceptible. Exploratory aspiration of the maxillary sinus will sometimes withdraw a clear watery

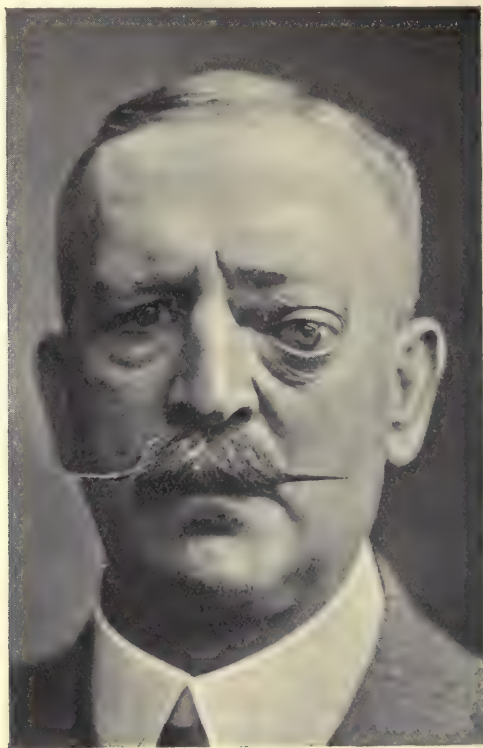


Fig. 166.—Suppurating mucocele of left frontal sinus.

or amber-coloured fluid. This is a rare condition nowadays, and former writers possibly confused it with dental cysts.

Etiology.—The cause of the condition is not well established. It may be due to catarrh, external injury, or congenital developmental anomaly (Lack). Both sexes are subject to it at any age after childhood.

Pathology.—The old view of this condition was that it was due to "catarrh" of the mucous membrane, and that when the

* Sir William Fergusson, "System of Practical Surgery," p. 597. London, 1870.

exit of this secretion was obstructed it accumulated and distended the cavity. These "mucoceleles" are much more likely to be caused by the development of cysts in the mucous membrane, either by the cystic dilatation of a gland or the cystic degeneration of a polypus. The cyst may then grow to such a size that it occupies the sinus and is mistaken for its cavity. The cyst-wall may rupture, and the fluid become free. The walls are thin and the contents vary. As a rule it is a viscous liquid, like inspissated mucus. There is a chronic inflammatory process in the lining mucosa and in the subjacent bone, which sometimes undergoes erosion and absorption. In this way not only does the floor of the frontal sinus disappear, but absorption may take place in the posterior or cerebral wall, leaving an opening as large as a half-crown (3 cm.), and exposing the dura mater. It is rare for the anterior frontal wall to be absorbed. In the case of ethmoidal mucoceles the os planum may be more or less destroyed.

The orifice of the frontal or ethmoidal cavities is not completely occluded in every case.

The secretion within the mucocele is generally of a thick, tenacious mucoid or viscous consistence, and sometimes distinctly purulent; it may be opaque and even caseous, or clear and limpid, like cerebro-spinal fluid. The colour varies; it may be white and opalescent, yellowish-white, transparent and syrupy, stringy like white of egg, or dull white like brain matter, or of a greenish-brown colour. The contents, even when purulent, may be sterile. It is important not to mistake a swelling in the orbit for a malignant growth. Such an error of diagnosis has led to the enucleation of a perfectly healthy eye.*

Treatment.—In ethmoidal mucocele, with any bulging into the nasal cavity, or evident disease in the ethmoidal labyrinth, it may be sufficient, under cocaine, to open up the ethmoidal cells from the interior of the nose. In the majority of cases it will be necessary to open the swelling from the outside. A curved incision is made below the inner extremity of the eyebrow, and the upper eyelid is partly detached and turned downwards. After the contents of the mucocele have been cleared out, a free communication with the nose is made by breaking down the floor of the frontal sinus or the inner wall of the ethmoidal labyrinth, if this has not already been absorbed. Sometimes it may be necessary to open part of the anterior wall of the frontal sinus and also remove the middle turbinal. The opening into the nose is made with burrs and curettes, and is large enough to admit a drainage-tube; this is kept in position for some

* G. Sterling, *Ann. des Mal. de l'Oreille*, xxxiii., ii., 1907, No. 11, p. 545.

weeks, during which it is syringed through daily. The method of procedure is, in fact, similar to the Ogston-Luc operation (p. 294).

There is no hesitation in recommending operative measures, for generally the disfigurement of the disease is worse than that left by the scar of the operation. As pyogenic organisms are not present, or only in insignificant number and virulence, there is not the same risk attending it as there is in the radical frontal-sinus operation (p. 291).

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 A. Logan Turner, *Edin. Med. Journ.*, Nov. and Dec., 1907.

CHOLESTEATOMA OF THE ACCESSORY SINUSES

A few cases of this rare condition have been described. It is characterized by an exaggeration of the usual symptoms of suppuration in these cavities, particularly by local pain. The cholesteatomatous masses are very fetid, the bony walls of the sinus are often rough, as if necrosed, and fistulæ may follow.

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- Gherardo Ferreri, *Arch. Internat. de Laryngol.*, xxv., 1908, No. 1, p. 52.
 Otto Kahler, *Wien. klin. Woch.*, xxi., 1908, No. 16, p. 562.
 Ernest Winckler, *Zeitschr. f. Laryngol.*, Bd. ii., 1909, Heft 3, S. 251.

ASPERGILLOSIS OF THE ACCESSORY SINUSES

The occasional occurrence of the aspergillus fungus in the nose has been mentioned (p. 188). A few cases are recorded where it has produced disease in the maxillary antrum.*

Etiology.—The conditions attending the growth of the aspergillus mycelium in the antral mucous membrane are not well known. The cases so far recorded have been amongst females.

Symptoms.—The chief one is marked nasal stenosis from pale swelling of the turbinals which does not yield to even a 20 per cent. solution of cocaine. This condition is associated with

* Douglas Harmer, *Proc. Roy. Soc. Med.*, Laryngol. Section, vi., Feb. 7, 1913, p. 91.
 Herbert Tilley, *Journ. of Laryngol.*, xxx., 1915, No. 4, p. 145. (Five cases.)

sneezing, a mucoid or slightly purulent discharge, expulsion of small viscous masses, and neuralgic pains in the cheek and face.

Examination.—This reveals the sodden swelling of the mucosa and an absence of any of the local points of pure pus which generally suggest a chronic empyema. The antrum is opaque to transillumination. Exploratory puncture may fail to expel the viscid contents of the cavity.

Diagnosis.—Suspicion of aspergillosis should be raised when attacks of sneezing (often described as "hay-fever") are associated with turbinal congestion which does not yield to cocaine, antral opacity, inability to irrigate the sinus, and the expulsion of small pieces of greyish-brown, semi-translucent material. This should be examined for the mycelium.

Treatment.—A Caldwell-Luc operation (p. 269) is generally successful, but the fungus may prove obstinate and only yield to syringing with peroxide combined with the internal administration of an iodide salt (Harmer). Persistence may be due to the invasion of the ethmoid or other cavities.

The appearance of the contents of a sinus is said to be characteristic (Tilley). The presenting surface is bluish-grey and glistening. The material inside separates easily, and is viscous and sticky like the contents of a muscatel raisin.

TUMOURS OF THE ACCESSORY SINUSES

These may be either simple or malignant. Among the former are oedematous hypertrophies (so-called myxomatous polypi), cysts, and osteomata; the latter comprise sarcomata, endotheliomata, and epitheliomata.* Neoplasms are not of common occurrence. They are more frequently met with in the maxillary sinus than in the other accessory cavities.

Maxillary sinus.—Polypoid hypertrophies have already been referred to. Cysts of the antrum may be due to (1) obstruction and dilatation of the glands of the lining membrane; (2) cystic degeneration of polypi; (3) dentigerous cysts; (4) dental cysts. The two latter are not true antral cysts, but only invade it from without (Fig. 167).† Osteomata,‡ fibromata, and true myxomata are rare (Jonathan Wright). Psammoma has been recorded.§

* Jacques et Gaudier, Soc. Franç. de Laryngol., Mai, 1907.

† P. Coryllos, "Les Adamantinomes," *Ann. des Mal. de l'Oreille*, xxxviii., 1912, No. 3, p. 246.

‡ W. Milligan, *Journ. of Laryngol.*, Sept., 1897, p. 490.

Jaboulay, "Ostéome du Sinus Maxillaire," *Gaz. des Hôp.*, 27 Nov., 1906. No. 135, p. 1611.

Goyanes, *Ann. des Mal. de l'Oreille*, xxxviii., 1912, No. 4, p. 430.

§ John C. Munro, *N.Y. Med. News*, March 4, 1905.

Among the malignant growths are epithelioma, carcinoma, and sarcoma.*

Frontal sinus.—Neoplasms are seldom met with in this cavity, and malignant growths are very rare. Cysts, osteomata, and fibromata are the innocent growths which have been recorded (Fig. 168). Some osteomata may be found free in the frontal sinus; others are attached by a more or less fragile pedicle; while yet others are so widely adherent that they resist detachment, and operation entails the risk of cerebral damage, particularly if they are attached to the deep wall of the frontal sinus.

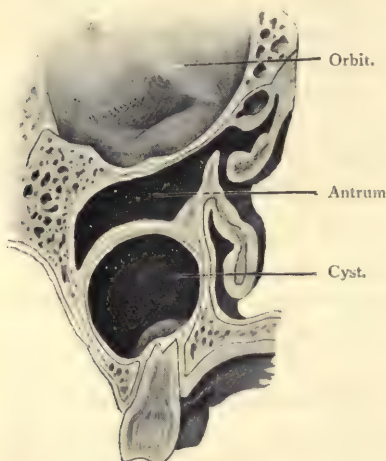


Fig. 167.—Dental cyst.

Transverse section showing a dental cyst invaginating the maxillary sinus, which is reduced in size and only comes into relation with the upper part of the inferior meatus. (Modified from Zuckerkandl.)

Ethmoid.—The occurrence of polypi and cysts has been dealt with (p. 225). Osteomata are occasionally met with presenting at the inner angle of the orbit. Carcinoma and epithelioma are not uncommon in elderly subjects, but it is important to remember that sarcoma may occur as early as the ninth or even the fourth year (A. A. Bliss).† These malignant growths have been described at pp. 216-24.

Sphenoidal sinus.—Polypi are not common. Nasopharyngeal fibromata, sarcomata, and carcinomata are not infrequently met with, but generally invade the cavity from the outside.

Diagnosis.—The age of the patient, the progressive character and constant pain, the occurrence of hæmorrhage, the external manifestations, the secondary involvement of glands and neighbouring tissues, as well as the applications of the tests employed for sinus suppuration, will help in determining the presence of a malignant growth. The simple neoplasms, in addition to the polypi

* Jonathan Wright, *N.Y. Med. Journ.*, Nov. 4, 1893.
Christopher Heath, "Injuries and Diseases of the Jaw." London, 1884.
Heymann, *Virchow's Arch.*, cxxix., 1892.
Bryan, Congress of Physicians and Surgeons, 1894.
Richou, *Ann. des Mal. de l'Oreille*, Fév., 1906, p. 209.
P. Sébilleau, *ibid.*, Nov., 1906, p. 430.
Jacques et Gaudier, *Arch. Internat. de Laryngol.*, No. 6, 1907.

† *Trans. Amer. Laryngol. Assoc.*, 1896, p. 46.

and cysts already described, declare themselves by their slow growth and evolution. Not uncommonly the outstanding symptoms are ocular, and we must also be prepared for meeting malignant disease in childhood.*

Treatment.—This has already been considered in regard to innocent growths. Malignant disease of the ethmoid has been studied in the chapter on Neoplasms of the Nose (p. 216). When cancer originates in the maxillary sinus, partial or complete resection of the upper jaw is often suggested, but it is of



Fig. 168.—Ivory exostosis removed from the frontal sinus of a young man. (*Sir Jonathan Hutchinson.*)

doubtful value; a Moure (p. 761) or a Rouge (p. 760) operation, or a combination of them, promises more hope and leaves less deformity. The operation of Denker also allows of direct inspection of the cavity, and of very complete removal without any external scar (Fig. 144, p. 272). Unfortunately, before the symptoms are sufficiently marked to attract the patient's attention, the disease has often advanced too far for operation. In other cavities operative treatment is almost hopeless.

FOREIGN BODIES

These have been incidentally referred to already. They are most frequently met with in the maxillary sinus. Considerable help is given in the diagnosis and treatment of such foreign bodies

* Sydney Stephenson, *Ophthalmoscope*, April, 1908, p. 253.

as metal drainage-tubes, broken ends of instruments, and bullets, by the employment of the Röntgen rays. A piece of metal has been known to lodge for four years in the antrum without causing important symptoms.*

A concretion (rhinolith) is exceedingly rarely met with in the antrum. Some 5 cases have been recorded.†

TUBERCULOSIS OF THE ACCESSORY SINUSES

Very few cases have been described. As a rule the tuberculosis is only an extension to the sinus from some neighbouring focus. In most instances the patients have pulmonary tuberculosis.‡

* J. O. McReynolds, *Laryngoscope*, xviii., March, 1908, p. 215.

† E. Oppikofer, *Arch. f. Laryngol.*, xx., i.

‡ J. W. Gleitsmann, *Trans. Amer. Laryngol. Assoc.*, xxix., 1907, p. 88.

REFERENCES: SINUS DISEASE

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PART IV.—DISEASES OF THE NASO-PHARYNX

CHAPTER XVIII

HYPERTROPHY OF THE NASO-PHARYNGEAL TONSIL

CONFIGURATION OF THE NASO-PHARYNX

RESEARCHES show (1) that the height of the naso-pharynx is very small in the infant, and increases steadily with age, and (2) that in the female the vertical diameter is relatively less marked than in man, and her naso-pharynx resembles the infantile in type, but it is not smaller than in the male. These rules are not absolute.*

The posterior choana may have the form of (1) an arched window, (2) an ellipse, or (3) an oval (Fig. 169). The first is the most common, and on an average measures in men 26 by 14 mm., and in women 24 by 13 mm. The dividing septum is generally vertical in the middle line, but asymmetry in the two choanæ may be met with, and it is more frequent in criminals, degenerates, inferior human races, and animals than in the Caucasian race.†

HYPERTROPHY OF THE NASO-PHARYNGEAL TONSIL

Synonyms.—*Adenoids* ; *adenoid vegetations* ; *naso-pharyngeal adenoids* ; *postnasal growths* ; *enlargement of the pharyngeal tonsil* ; *hypertrophy of Luschka's tonsil*, or the 3rd tonsil.

The anatomy and physiology of the ring of lymphoid tissue guarding the entrance to the air- and food-passages has already been considered (p. 8). When the collection of lymphoid tissue on the roof of the naso-pharynx is chronically hypertrophied it is known by the generally accepted name of "adenoid growths."

* Escat, "Maladies du Pharynx," p. 1. 1901.

Chauveau, "Pathologie comparée du Pharynx." Paris, 1902.

Moure and Lafarelle, Soc. Franç. de Laryngol., 1901; and *Rev. Hebdomadaire de Laryngol.*, 1901, ii., pp. 689 and 721.

John M. Ingersoll, *Trans. Amer. Laryngol. Assoc.*, 1909, p. 38.

† S. Citelli, *Arch. Ital. di Laryngol.*, xxiii., 1, 1903.

Cases of this affection are so common that they are found in 21·67 per cent. of the patients frequenting a special clinic.*

Etiology.—It is difficult to determine at what stage the amount of this tissue ceases to be physiological, and has to be regarded as pathological (Fig. 170). A palpable amount is not present in all children. Bosworth contends that an enlarged tonsil is an abnormality, and should be removed like any other homologous growth.

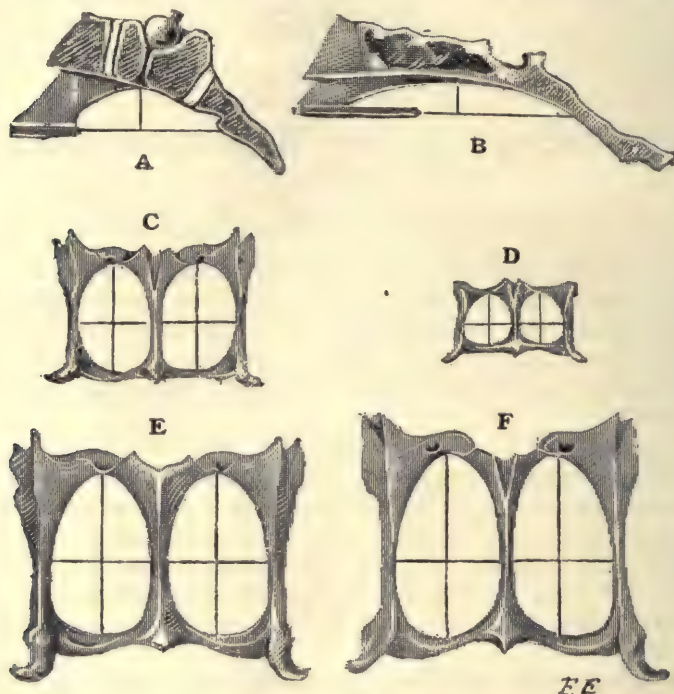


Fig. 169.—Life-size drawings of the naso-pharynx.

A, Sagittal section of the naso-pharynx at birth, showing persistence of the canal lodging Rathke's pouch (cf. Fig. 2, p. 2); B, sagittal section of the naso-pharynx of a dog; C, choanæ of a child aged 5; D, choanæ at birth; E, choanæ of an adult female; F, choanæ of an adult male. (*Escat.*)

I am inclined to regard any tonsil as pathological as soon as it reveals itself clinically; and although this view does not mean that it should necessarily be removed, it would warrant its being regarded as an unnecessary formation, with latent potentiality for harm.

The precise etiology of this hyperplasia is at present unsolved. In a few cases it is met with at birth or shortly afterwards, but it most commonly occurs between the ages of 3 and 12 (Fig. 171). Towards the age of puberty the growth tends to atrophy, and its disappearance is generally complete between the 18th and the 20th year (Fig. 172). It may, however, be met with at any age, even in

* Y. Arslan, *Arch. Ital. di Otologia*, ix., 1899, fasc. 2, p. 159.

patients over 50. It affects equally both sexes and all classes of the community. There is no evidence that "scrofula" is responsible for the overgrowth of Luschka's tonsil, but attention has lately been called to the condition of "**status lymphaticus**," in which there is enlargement of practically all the lymphoid tissues of the body, including the thymus, the mesenteric glands, the solitary follicles and Peyer's patches in the intestines, the spleen, the tonsils, and the adenoid tissue in the naso-pharynx. The thymus may weigh as much as $4\frac{1}{2}$ ounces. Hyperplasia of the arteries in these cases has been noted, leading to narrowing of the lumen. Such patients



Fig. 170.—The pharyngeal tonsil in the foetus.

The naso-pharynx of an 8-months foetus, showing the ridges of adenoid tissue radiating like an aigrette from the central and median pharyngeal recess—the depression which, later in life, may be met with as the bursa pharyngea or pouch of Rathke. (*Escat.*)

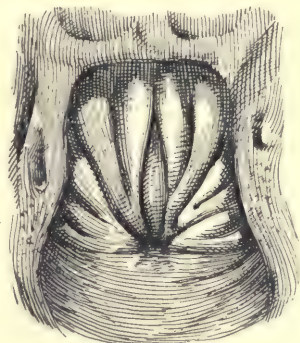


Fig. 171.—The pharyngeal tonsil in a child of 1 year.

The fissures converging to the median pharyngeal recess are deeper, and the intervening ridges are more marked. (*Escat.*)

have a feeble circulation, and may die suddenly under chloroform or any shock or strain.† Although status lymphaticus may be suspected, it is difficult if not impossible, with our present knowledge, to

* Escat, "Évolution et Transformations Anatomiques de la Cavité Naso-Pharyngienne." Paris, 1894.

† Bosworth, "Diseases of the Nose and Throat," i., p. 541.

W. J. McCardie, *Brit. Med. Journ.*, Jan. 25, 1908, p. 196.

Harvey Hilliard, *ibid.*, p. 202.

W. Humes Roberts, *Laryngoscope*, xviii., 1908, Sept., p. 725.

Thomas J. Harris, *Trans. Amer. Laryngol. Assoc.*, 1909.

H. Bellamy Gardner and Salusbury Trevor, *Trans. Roy. Soc. Med.*, Dec., 1909, and subsequent debate.

Howland, *Proc. Path. Soc., Philadelphia*, Sept., 1909; and Epitome in *Erit. Med. Journ.*, Jan. 22, 1910.

Dudley W. Buxton, *Lancet*, Aug. 6, 1910, p. 365.

Haven Emerson, *Proc. XVIIth Internat. Cong. Med.*, London, 1913.

J. Payson Clark, *Boston Med. and Surg. Journ.*, Jan. 26, 1911, p. 115. (Complication in a case of foreign body in the trachea, where the thymus extended from the neck to the diaphragm.)

G. H. Cocks, *Laryngoscope*, xxii., 1912, No. 8, p. 997.

A. E. Garrod, A. MacLennan, D. P. D. Wilkie, and C. McNeil, *Brit. Med. Journ.*, Oct. 3, 1914, p. 571.

Le Boutillier, *Arch. of Pediatrics*, May, 1915; and *Brit. Med. Journ.* Epitome, Aug. 14, 1915.

recognize it during life. The enlargement of the lingual tonsils and the shadow thrown by the thymus gland on the X-ray screen are accessible signs (cf. p. 584).

So widespread is the affection that it is difficult to say how far adenoids are hereditary. It is certain that they tend to "run in families." No climate or race appears exempt. The researches of Meyer have shown that the Hebrew race is especially predisposed to this hyperplasia, and that it occurs in the Esquimaux near the North Pole, as well as in the Malay on the Equator.* The negro, probably owing to his wider nasal passages and lower hard palate, is but slightly affected. But there is no doubt that adenoids are very much more frequent in temperate, cold, damp climates like our

own, that of North America, and the northern States of Europe.† Osler is of opinion that there are more mouth-breathers to the acre in England than in any other country. Anyone travelling south through Italy must be struck by the steady diminution of the number of mouth-breathers encountered. This is borne out by the statistics of Gradenigo and Massei. The former, in the sub-Alpine climate of Turin, found these growths present in one out of every three children coming to his clinic,‡ while the latter, in the more balmy air of Naples, saw only five cases in fifty years.§

Adenoids are no new disease. The pharyngeal tonsil was first described by Santorini in 1724.|| Meyer¶ and Semon** have drawn attention to pictures of the Renaissance, or busts of antiquity,

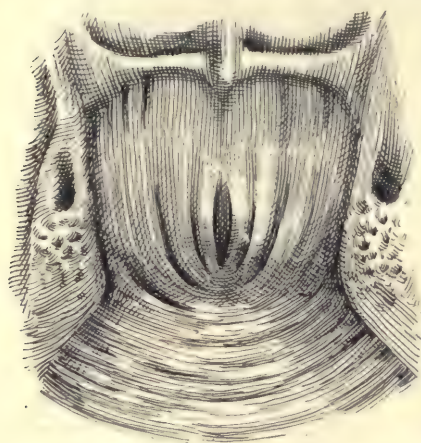


Fig. 172.—The pharyngeal tonsil undergoing involution, from a female aged 17.

Atrophy is marked: the thickness of the mucosa has diminished by 3 mm.; the ridges are disappearing. The median recess is reduced to an elliptical fissure about $\frac{1}{2}$ cm. long. (Escat.)

where the features are almost typical of the adenoid subject.†† Indeed, although the direct cause of the headache and the otorrhœa escaped the acute observation of Hippocrates, yet he noticed their association with the adenoid facies when he wrote that "those who suffer from headache and running ears have a high-arched palate and irregular

* *Hospitals-Tidende*, Feb. 6 and 13, 1895; and *Practitioner*, July, 1896, p. 82.

† V. Grazzi, *Clin. Moderna*, x, 1904, Ni. 4-5, 6-7.

‡ *Atti del III. Congresso della Soc. Ital. di Laringol.*, etc., p. 41.

§ Cardone, *Arch. Ital. di Laringol.*, v., No. 5.

Triflelli, *ibid.*, 1895.

|| "Observ. Anatomica." Venetiis, 1724.

¶ *Med.-Chir. Trans.*, London, 1868.

** *Internat. Centralbl. f. Laryngol.*, x., 1894, p. 594.

†† R. Vitto-Massei, "Le Affezioni dell' Orecchio nell' Adenoidismo." Rome, 1913.

teeth."* The pharyngeal tonsil has been studied by Killian and others in mammals, birds, and even reptiles.†

Hypertrophic rhinitis, deviations and spurs of the nasal septum, and other forms of nasal obstruction, are said to favour the development of adenoids. It is much more likely that these intranasal conditions are secondary to them (p. 95). The pharyngeal tonsil shares in all catarrhal attacks of the nose and throat, and any hypertrophy shows a marked increase after such acute infections as measles, scarlatina, diphtheria, and whooping-cough. It is so frequently associated with chronic hypertrophy of the palatine tonsils that the discovery of the latter in children always indicates the presence of some lymphoid thickening in the naso-pharynx. The contrary does not hold good; i.e. a large mass of adenoids may exist without any marked palatine tonsils. The tendency to overgrowth of lymphoid tissue is shown by the observation that when adenoid growths are removed and small tonsils are left untouched, the latter may atrophy in some instances, but in others they appear to be stimulated into increased growth.

Congenital syphilis and tuberculosis do not exert any marked influence in the production of adenoid growths, beyond the predisposition given by a feeble constitution. The same may be said of rickets. In an institution for rickety children, Biaggi found that the enormous proportion of 90 per cent. had adenoids, 40 per cent. slept with open mouths, and 60 per cent. had enuresis nocturna.‡ Disturbance of the function of the thyroid gland was invoked as a cause some years ago,§ but further investigations have failed to support this hypothesis.||

Pathology.—The adenoid hypertrophy varies in shape and size. It may consist of a soft, diffuse, friable mass of lymphoid tissue such as is seen scattered on the posterior pharyngeal wall in granular pharyngitis. This collection is covered with a thin layer of epithelium, is frequently of only temporary prominence, and when scraped away has much the appearance of vascular granulation-tissue. In the next stage the lymphoid tissue is heaped up into a more decided central cushion, which, while never disappearing entirely, is capable of much variety in size. This form is also prone to temporary turgescence or inflammation, and much of the variability in the symptoms produced by its presence is to be ascribed to catarrh, and such morbid changes



Fig. 173.—Adenoids, life-size, drawn from fresh specimen.

(See also Fig. 187, p. 338.)

* A. Delpuech, "Hippocrate et le Facies Adénoïdien," *Presse Méd.*, 5 Mars, 1898.

† G. Alagna, *Arch. Ital. di Laringol.*, xxii., 1902, p. 157.

‡ *Ann. des Mal. de l'Oreille*, Fév., 1905, p. 192.

§ E. Hertoghe, *ibid.*, 1898, ii. 478.

|| De Simoni, *Bollettino delle Mal. dell'Orecchio*, etc., p. 50. Firenze, 1899.

Ostino, *Gaz. Medica di Torino*, 1899, Ni. 12, 13.

Tommasi, *Arch. Ital. di Laringol.*, xx., 1900, No. 3.

V. Grazi, *Clinica Moderna*, x., 1904, Ni. 4-5, 6-7.

in it as lacunar or purulent infections. The third variety is that of the established pharyngeal hypertrophy. This is generally a smooth, soft cushion made up of longitudinal ridges. The tonsil is widest and thickest at the end nearest the roof of the choanæ. It tends to taper and become thinner as it sweeps backwards over the vault of the cavity, to end on the posterior wall (Figs. 173, 178, 181, and 187, p. 338). Frequently the lateral ridge on each side separates from the main mass as it passes backwards. The ridges or folds are about the thickness of a cock's comb, sometimes distinctly separated from one another, and about half an inch deep. In other cases the clefts are only slightly marked. Another variety is met with in older subjects, when some form of subinvolution has taken place. The tonsil is then harder, possibly from the result of repeated inflammatory attacks. The ridges and folds may still be present. As a rule the tonsil is more contracted, and may have shrunk into a central pad. Or it may be more spread out and diffused, so that its boundaries are ill defined, and it merges gradually at each end into the surrounding surface, while at each side it shades off into the lateral walls and the posterior lips of the Eustachian orifices. It is this last process of fibroid atrophy which sometimes leaves behind it the cicatricial bridges or adhesions that may be seen in the fossa of Rosenmüller and salpingopharyngeal folds.

Histologically these growths are made up of lymphoid tissue, i.e. groups of round cells in a small amount of connective tissue. The latter is much less than in the palatine tonsils, and hence allows the soft, formless adenoid tissue to assume more varied shapes, while it is softer and more vascular. The epithelium may change from the columnar to the squamous type, and the cilia may disappear.* Naso-pharyngeal adenoids are subject to acute (Plate XII., Fig. 3) or chronic inflammation. They may contain cysts (p. 343) or be invaded by keratosis (p. 417), syphilis (p. 670), or malignant growths (p. 454).

A process may take place in the clefts of the pharyngeal tonsil precisely similar to that occurring in the crypts of the palatine tonsil. Cheesy secretion is then met with, which on occasions becomes of a dirty-brown colour, mortar-like consistency, and horribly fetid. It may get more or less encysted by a superficial inflammation of the ridges. In other cases the mucous glands become occluded and retention cysts are formed.

Micro-organisms, mainly of pyococcal form, are often found superficially.

Symptoms.—These present a considerable range of variety, depending on the age and predisposition of the patient, the size, shape and changes taking place in the hypertrophy, and the capacity of the cavity in which it is lodged. They were very well described in the original paper by Wilhelm Meyer.†

The symptoms may be considered as they produce (1) nasal obstruction, (2) secondary infections, (3) disturbance in secretion, (4) reflex symptoms, and (5) constitutional changes. These have

* McBride and Logan Turner, *Edin. Med. Journ.*, 1897, i.

† *Med.-Chir. Trans.*, London, 1868.

Fig. 1.—Adenoid growths, as seen in the postnasal mirror. (*See*
p. 327.)

Fig. 2.—Retronasal phlegmon. Acute infection of adenoid remains
in a patient aged 45.

Fig. 3.—Fibroma of the naso-pharynx, as seen by posterior rhino-
scopy, in a boy aged 12. (*See* p. 345.)

(*From Grünwald's "Atlas and Epitome of Diseases of the Mouth, Pharynx,
and Nose."*)

PLATE XII.



PLATE XII.

been so fully considered in the chapter on Symptoms of Nasal Disease (p. 92), that they need only be briefly considered.

1. When present in the infant, the chief symptoms are those of nasal stenosis and its sequelæ (p. 92). Such infants are apt to suffer from convulsions, laryngismus stridulus, and vomiting. They are said by their mothers to "swallow their tongue," or to "fight so for breath that one thinks they must choke in the night." If not relieved, these infants must be fed with the spoon, otherwise they perish from inanition.

In children from about 3 years of age onwards a marked case presents a typical appearance. The mouth is open; the lips are thick, the upper one hitched up; the teeth project; the chin recedes. The alæ nasi are atrophied and pinched from want of use, and the nasal orifices are reduced to two elongated slits (Fig. 61, p. 97). The naso-labial furrow is absent, and the disuse of the muscles between the upper lip and eye gives the face a flat, smooth, characterless expression. A vein across the root of the nose is often marked, and an accentuation of the fold of the upper eyelid at the inner canthus sometimes adds to the typical expression. Such children may have, especially under catarrhal conditions, a more or less constant discharge of muco-pus from the anterior nares, leading to excoriation and eczema of the upper lip. Other children are said to have a "dry nose," as the anterior nares become blocked, and the discharge is then swallowed. (Fig. 174.)

The obstructed nose causes the adenoid child to breathe noisily even in quiet respiration, to get out of breath readily on exertion, and to breathe heavily, snore, and be restless in sleep. The dryness of the open mouth leads to frequent complaints of thirst. The adenoid child is apt to bolt his food. Thorough mastication of it is impossible, as the necessary closure of the lips would entail asphyxia. In other cases he is reported to "spend hours over his meals," since he frequently has to give up munching in order to take in a mouthful or two of air.

The obstruction in the resonating upper chambers leads to the "dead voice" which, in children, is so suggestive of this condition (p. 98). Another consequence of the obstruction at the back of the nose is the development of secondary changes in the nasal chambers.

Hæmorrhage from these growths is a source of epistaxis in children, but the blood may also come away through the mouth, or be swallowed and vomited. When it is reported that blood is found on a child's pillow, it is a very likely symptom of adenoids.

2. The most common and at the same time most important secondary affection is that of the organs of hearing. Of 149

adenoid children, G. B. Wood found ear trouble in 63 (42 per cent.).* In 375 schoolboys between $6\frac{1}{2}$ and $12\frac{1}{2}$ years, Wilbert found adenoids in 231 (62 per cent.), and 27 per cent. were affected in their hearing.†



Fig. 174.—A boy aged $4\frac{1}{2}$, suffering from adenoid vegetations of the naso-pharynx, showing the characteristic expression, attitude, and deformities of the chest. (Cf. next figure.)

Amongst 1,573 school children, Cohn found that 315 were more or less deaf, and that in these latter the deafness was due to adenoids and their sequelæ in 60 per cent. of cases.‡ Gradenigo found ear mischief in 70 per cent. of adenoid children.§ In 1,000 school children A. H. Cheatle found adenoids present in 434, and 394 of these had some aural trouble.|| Investigating 1,246 elementary school children, Macleod Yearsley found that 51 had ear affections, and every one of these deaf children had adenoids.¶

Abscesses or "gatherings" in the ear in childhood are in the large majority of cases caused by adenoids, but even fugitive pains in the ear, or slight variable deafness, are often an indication of their presence. Conjunctivitis, blepharitis, keratitis, and other ocular troubles are often traceable to these growths.

* *Amer. Med.*, Oct. 3, 1903.

† *Deut. med. Woch.*, Feb. 5, 1903, and *Brit. Med. Journ.* Epitome, March 7, 1903.

‡ *Zeitschr. f. Ohrenheilk.*, Bd. lli., No. 3, from Epitome in *Ann. des Mal. de l'Oreille*, xxxiv., 1908, p. 237.

§ *Atti del III. Congress della Soc. Ital. di Otol.*, etc., p. 61.

|| *Trans. Otolog. Soc. of United Kingdom*, iii., April 14, 1902, p. 74.]

¶ *Brit. Journ. of Children's Dis.*, Feb. and March, 1910.

The so-called "glandular fever"—attacks of swelling and tenderness in the glands of the neck, with irregular rise of temperature—is not a disease *sui generis*, but depends on local infection of the adenoid tissue of Waldeyer's ring, most commonly that of the naso-pharynx. It is generally recognized that the faucial and pharyngeal tonsils are important channels of infection in tuberculosis. They may not themselves become tubercular, although their tissues are traversed by the bacilli on their way to the glands. But latent tuberculosis of adenoid growths has now been demonstrated by numerous observers, the frequency of its occurrence varying from 3 per cent.* to 16 per cent.† This tuberculosis rarely reveals itself by any clinical symptoms.

Of secondary affections, the child may show enlargement of the cervical glands, defective pulmonary expansion, chronic bronchitis, anæmia, gastrointestinal catarrh, and vomiting.

3. The disturbances in the secretion from the nose and naso-pharynx have been described.

4. Numerous reflex neuroses are often traceable to the presence of

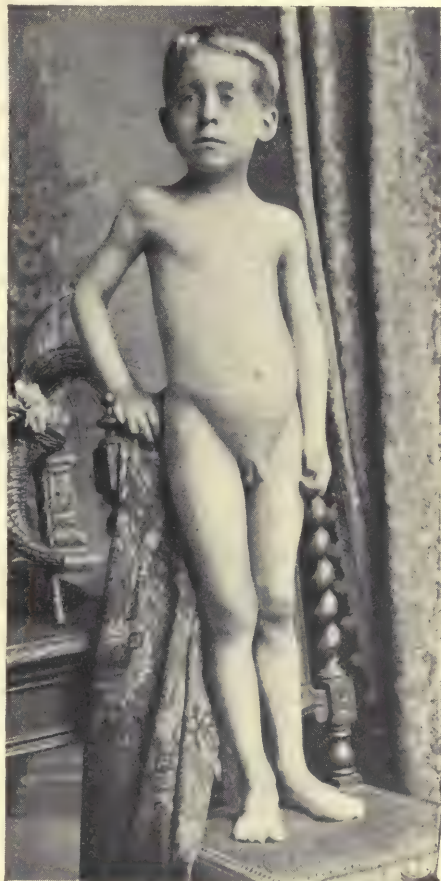


Fig. 175.—A boy aged 5 years and 4 months, from whom naso-pharyngeal adenoids had been removed seven months previously. (Cf. Fig. 174, showing same patient before operation.)

* McBride and Logan Turner, *Edin. Med. Journ.*, May, 1897.

† Plüder and Fischer, *Arch. f. Laryngol.*, iv., Heft 3.

References to other researches will be found in articles by F. Ivens, *Lancet*, Sept. 16, 1905; E. Hamilton White, *Amer. Journ. Med. Sci.*, Aug., 1907; StClair Thomson, *Practitioner*, July, 1901.

these growths and their interference with respiration, sleep, eating, digestion, and development. Among them are enuresis, night terrors, twitching in sleep, asthma, laryngismus stridulus, chorea, epilepsy (*petit mal*),* stammering, stuttering, convulsions, restlessness ("the fidgets"), reflex cough, and hawking and scraping in the throat.

R. Crawford holds that of all the factors in enuresis nocturna, the one which is most favourable is the presence of adenoids, and many other observers share this view.† But V. Lange examined 50 children with enuresis nocturna; only 8 of these had adenoid growths, and, although operated on, the condition was not in any way improved in 7 instances. He concludes that the adenoids and enuresis may coexist, but are quite independent.‡ Leonard Williams suggests that the enuresis as well as the adenoids are both results of thyroid insufficiency.§

5. Constitutional changes. It is not surprising that children handicapped by the presence of these growths should often be anything but robust, and may grow up physically and mentally deficient. Their physiognomy may be damaged by a high-arched palate and projecting teeth (Fig. 62, p. 98). It is nasal obstruction, and chiefly adenoids, which accounts for the flattening of the lower costal walls, the retracted chest, and the pigeon-breast met with particularly in rickety children (*see* p. 99). The arched palate, so frequently present with adenoids, may be due to the nasal stenosis, or to rickets. According to Marfan, "nearly all children who have adenoid growths are rickety."||

The mental condition of such children is often remarkable. They frequently complain of headache, and are indifferent, listless, easily fatigued, irritable, peevish, and bad-tempered. Often they do not care to join in games, and are seldom heard singing or whistling. Those of them who are naturally intelligent prefer to devote themselves to books, instead of failing in competitions

* Lennox Browne, *Rev. de Laryngol.*, xxiii., 1902, p. 116.
 Pigaso, *Ann. des Mal. de l'Oreille*, 1904, i., p. 402.
 StClair Thomson, *Practitioner*, May, 1905.

† R. Crawford, *King's Coll. Hosp. Repts.*, vol. iv.
 Etiévant, *Rev. Hébd. de Laryngol.*, xxiv., 1903, p. 27.
 Fischer, *ibid.*, xxiii., 1902, p. 601.
 Fischer, *Laryngoscope*, xlii., 1903, p. 163.
 Grönbeck, *Arch. f. Laryngol.*, 1895, ii., p. 214 (12 cured and 7 benefited out of 23).
 Huber, *Med. Review* (abstract), 1900, iii., p. 182 (427 cases of adenoids, 61 with enuresis; 39 were operated, 26 with complete cure, and 11 with great improvement).

Zwillinger, *Ann. des Mal. de l'Oreille*, 1904, i., p. 402.

‡ *Monatsschr. f. Ohrenheilk.*, 1906, No. 9.

§ *Lancet*, May 1, 1909, p. 1245.

|| *Semaine Méd.*, Sept. 18, 1907; from *Epitome in Brit. Med. Journ.*, Feb. 29, 1908

or sports, and are often driven to be reclusive and sullen, as they find themselves misunderstood by parents and teachers. Others appear unable to fix their attention on anything for any length of time, and to this condition Guye has given the name of aprosexia (*see* p. 95).

So frequent is this association, that in a school of 375 boys there were 26 described as bad scholars, and of these no fewer than 22 had adenoids (84 per cent.). Of 84 boys forming the bottom 12 in each class, 65 suffered in this way (77 per cent.).* These proportions are less marked in children over 12 years of age. It has been suggested that in many of these cases of aprosexia the accompanying deafness was the true cause of their educational backwardness. This is not a sufficient explanation in most cases.

The physical and mental defects of adenoid children are to some extent explained by the blood examinations. These show a slight anæmia and leucocytosis. The hæmoglobin and alkalinity of the blood



Fig. 176.—Adenoid growths.

Sagittal section of the naso-pharynx, showing the situation of these growths, and their relations to the Eustachian tube, soft palate, pharynx, etc. (*After Castex and Lacour.*)

* Wilbert, *Deut. med. Woch.*, Feb. 5, 1903, Epitome in *Rev. Hebd. de Laryngol.*, xxiv., 1903, p. 706.

have been found less than normal, and the blood condition has always improved after operation.*

Careful comparative investigation of a number of children shows that, for subjects of the same age, adenoid children have a pulmonary capacity about one-fifth less than normal.† But in many cases the symptoms cannot be explained from the merely

mechanical results of obstructed nasal respiration. Children who are not mouth-breathers, and present no deformity of face or chest, may come under notice with malnutrition, stunted development, anæmia, capricious appetite, intractable disposition, mental perversity or dullness, and a tendency to contract catarrh from slight exposure. It is possible that these conditions may be caused by the presence of adenoids in a capacious naso-pharynx, where, by some internal secretion, they produce a condition allied to the affections induced by other glandular disorders, and comparable to such diseases as acromegaly and myxœdema. In support of this, it is noticeable that the beneficial results of operation are not always proportionate to the amount of growth removed.‡ It has also been suggested that in certain cases the results may be associated with the occasional



Fig. 177.—Adenoid growths.

Coronal section of the naso-pharynx, showing the situation of these growths on the roof and posterior wall of the naso-pharynx. Viewed from the front. (After Castex and Lacour.)

presence of a downward continuation of the hypophysis cerebri, which undergoes some change after the adenoids have been removed.

* Lichtwitz and Sabrazès, *Arch. Internat. de Laryngol.*, Fév., 1900, p. 12.

F. Federici, *Bollettino delle Mal. dell'Orecchio*, xxiv., 1906.

Rosier and P. Tissie, *Ann. des Mal. de l'Oreille*, xxxix., 1908, p. 18.

Mendel, "Physiologie et Pathologie de la Respiration Nasale." Paris, 1897.

Takabake, *Arch. of Otol.*, xxxiv., Feb., 1905.

† G. Raucoule, *Ann. des Mal. de l'Oreille*, Juin, 1905, p. 606.

C. Poli, *Arch. Ital. di Otol.*, xiv., 1903, fasc. 2.

‡ Harrison Allen, *Med. News*, June 22, 1895.

In adults.—If a marked case is neglected in youth, the patient may grow up with many stigmata about him (Fig. 62, p. 98). Turbinal hypertrophies, septal spurs, deviations, and so forth are likely to be left in the narrowed nose, while the long-continued mouth-breathing may leave as a legacy a chronic hypertrophic catarrh of pharynx and larynx. In many cases the "dead speech" is a permanent inheritance, while the damaged ears bear witness to the harm wrought by adenoid growths. Or, with the development of the bones of the head, the naso-pharynx is no longer so relatively small as in the child, and mouth-breathing may cease. As a rule this is only during the day, and the patient continues to be a mouth-breather and snorer at night. With the closure of the mouth in the daytime it is seen that the upper lip, from defective use, is small, while the lower one is often relaxed and prominent. In some cases the upper jaw remains undeveloped, while the unimpeded nutrition of the lower one brings about prognathism. In such cases the adenoid growths may have completely disappeared, or the only evidence left may be the cicatricial adhesions around the Eustachian tubes. If any growth is still present, it tends to be fibrous.

The growths in adults may cause so few symptoms as to escape notice, until trouble in the middle ear, defective vocal resonance, or postnasal catarrh calls attention to them.

Examination.—The so-called "adenoid facies" should really be termed the facies of nasal obstruction (p. 95), but adenoid hypertrophy is so generally the cause of this particular physiognomy that a tentative diagnosis is often founded on it. If there are enlarged cervical glands, the probability is much increased, and if there is some affection of the ear, it almost reaches a certainty. It is well to begin the examination by inspecting the ears, as the proceeding is free from discomfort and enables one to gain the confidence of the patient. Any lesion of the ear may be met with, from simple Eustachian obstruction up to purulent otitis media with its various complications and mastoid infection. It is very important to discover any interference with the auditory apparatus. I know of nothing in children under 12 years of age which can produce decided retraction of the drum membranes except nasopharyngeal adenoids. Healed scars, perforations, granulations, discharge and other middle-ear changes are strongly suggestive of the presence of adenoids, although they may also be consequent to scarlatina, measles, or other exanthemata, or be dependent on intranasal conditions. Anterior rhinoscopy frequently reveals stenosed nasal chambers, sometimes with the secondary changes described, and often clogged with muco-pus. A careful inspection

of the depths of the nose may disclose, just under the arch of the fornix, the moist glistening edge of the growths (Fig. 13, p. 19).

In the mouth, the observer will notice any distorted teeth, frequently dry and decayed; inflamed and spongy gums; and any arching of the hard palate. The soft palate is often relaxed, and a well-marked limit of congestion indicates its constant exposure to mouth-breathing. The presence of any palatine tonsils in children, especially with a record of mouth-breathing, indicates the presence of overgrowth in the pharyngeal tonsil. Equally positive is the evidence afforded by the discovery of discrete



Fig. 178.—Adenoids as seen in a case of cleft palate.

granulations of lymphoid tissue on the posterior pharyngeal wall, similar to those seen in the granular pharyngitis of adults. When the tongue is depressed and the patient gags, a mass like gummy white of egg is frequently seen issuing from the postnasal space, and sliding down the posterior wall of the pharynx. This is regarded by McBride as pathognomonic of adenoids. In marked cases the lower edge of the growth may occasionally be seen on the posterior wall of the pharynx; it is generally visible in cases of cleft palate (Fig. 178), and occasionally it can be viewed directly by gently raising the edge of the soft palate with the

tongue-depressor. In the majority of children the patient physician can obtain a view of the postnasal space by posterior rhinoscopy, particularly if, instead of the alarming metal instrument, he uses his own forefinger as a tongue-depressor (Fig. 21, p. 26). The growth will then be seen as a dark pink cushion, more or less obscuring the view of the upper part of the septum, and possibly festooned with clinging mucus or marked with caseous deposits in the clefts (Plate XII., Fig. 1, facing p. 320). Owing to the foreshortening of the reflected image the ridges frequently appear in the mirror more like stalactites (Fig. 28). The growth may be overlooked if the posterior wall is not carefully inspected (Fig. 27).

A digital examination is required when there is any uncertainty as to the nature of the growth seen (*see* p. 34). The sensation conveyed to the examining finger has often been compared

to that of touching a bunch of earth-worms. The soft cushion, or lobulated growth, is generally so vascular that the examining finger, however gently used, is found stained with blood. In older patients the growth is firmer, but any marked hardness, or any profuse bleeding, should be viewed with suspicion (p. 354).

But digital examination is not necessary in all cases where posterior rhinoscopy is impossible. If there are evidences of obstruction to nasal respiration in a child, and examination of the nose and pharynx does not explain it, then it can safely be concluded that adenoids are present. Again, if there is undoubted implication of the ear, together with the outward indications of adenoids, their presence can generally be assumed. In either case, if the child is a very nervous subject, a more complete examination can be deferred until he is under anæsthesia for operation.

Differential diagnosis.

— This is not difficult. The facial expression or dead voice may be enough in many cases. Still, the facies of the mouth-



Fig. 179.—Mongol idiot, with trifling amount of adenoids.

breather is not peculiar to hypertrophy of the pharyngeal tonsil, but occurs with various forms of nasal stenosis, and is frequently met with in subjects of deficient mental development (Fig. 63, p. 99), in the Mongol type of idiot (Fig. 179), and in achondroplasia.* On the other hand, it must not be forgotten that these adenoid growths can be present, causing such marked secondary results as to call for prompt operation, and yet the patient may present none of the stigmata of the adenoid facies (Fig. 60, p. 96). Hence a child may have the adenoid type and yet have a clear post-nasal space (Fig. 63, p. 99),† while another may have unquestionable hypertrophy without suggesting it in appearance or voice (Fig. 180). As Castex expresses it, "On

* Guthrie Rankin, *Brit. Med. Journ.*, June 30, 1906.

† Escat, *Arch. Internat. de Laryngol.*, 1896, No. 5; and *Practitioner*, 1897, p. 80.

peut être adénoïdien sans le paraître, comme on peut le paraître sans l'être."*

Prognosis.—It is frequently maintained that some adenoid thickening is present in all children. This is stated by A. H.



Fig. 180.—Naso-pharyngeal adenoids.

A boy aged 3, who does not yet present any of the features of the so-called "adenoid facies." Note the bright and intelligent look, the well-developed nostrils, the lines of expression round the closed mouth. Yet this child suffered from frequent feverish attacks, enlarged glands, and repeated attacks of acute otitis media. The actual size of the adenoid growth removed is shown in Fig. 181. All these symptoms disappeared after operation; he is now 17 years old; his ears are normal; and he has none of the stigmata or sequelæ of adenoids.

Cheatle, who examined 1,000 individuals, to be a mistaken idea, though he did find a growth as frequently as 43·4 per cent.† In a school of 500 poor children, C. Hennebert found adenoids in 32 per cent.‡ Other observers have detected it in only 10·2 per cent. of school children.§ By adding and comparing the statistics compiled by various authors from the examination of over 12,000 children, Burger finds that the symptoms of speech and facies only indicate adenoids in 3·3 per cent., but local examination will reveal their presence on the average in 29·8 per cent.|| It would be impossible to say how many of this 29·8 per cent. of children require to have the adenoids removed, without following their medical history over several years. But

Wilbert, whose statistics

furnish a higher proportion, viz. 62 per cent., found that in half of them (i.e. in 33 per cent. of school children) symptoms were

* "Maladies du Larynx, du Nez et des Oreilles," p. 425. Paris, 1899.

† *Journ. of Laryngol.*, 1902, p. 282.

‡ *La Clinique*, 12-19 Juillet, 1902. § Stangenberg (quoted by Burger).

|| H. Burger, *Arch. f. Laryngol.*, Bd. xviii., Heft 2.

referable to the growths, 27 per cent. being affected in their hearing, and 5 per cent. showing nervous disturbance.*

Lymphoid tissue in this region, if it has not disappeared earlier, tends to atrophy between the ages of 10 and 15. At this period the naso-pharynx enlarges, so that obstructive symptoms become less marked. But, before this time is reached, permanent damage may have been done to the appearance, voice, hearing, nervous and mental character, and physique of the patient, while the most important educational years of his life have been passed in ill-health, and possibly unmerited neglect and reproof. Temporary congestion of Luschka's tonsil takes place in most catarrhs, and it shares in all acute infective processes attacking the throat—measles, scarlatina, diphtheria, etc. If no secondary effects can be attributed to the inflamed gland, and the accompanying catarrhal and other symptoms appear transitory, then operative treatment can be deferred until a trial has been given to medicinal and hygienic measures. But if the condition appears permanent, and any of the following symptoms are present, I consider it is advisable that the treatment should be surgical. The symptoms referred to are—



Fig. 181.—Adenoid growth.

Specimen, hardened in spirit, removed from the boy shown in Fig. 180. Life-size drawing.

Mouth-breathing in the day.

Frequent mouth-breathing at night; or noisy or restless sleep, with symptoms of respiratory obstruction.

Night terrors.

Chronic muco-purulent catarrh.

Hypertrophic rhinitis.

Frequent cold-catching.

Any catarrhal affection of the ear.

Chronic enlargement of the palatine tonsils.

Spasmodic cough.

Enlarged cervical glands.

Threatening malformation of the chest or hard palate.

Aprosexia, headache, and any of the neuroses mentioned which cannot be explained and relieved by reference to other factors.

How frequently interference may be called for can to some extent be judged from figures in the article already quoted by Wilbert. Of the 231 adenoid children he found that 167

* *Loc. cit.*

(73 per cent.) were suffering from physical or intellectual troubles which he felt entitled to attribute to this affection. This was at the time of his examination; and when we recollect the risks the remaining 27 per cent. might run, it will be seen that surgical treatment is called for in a large majority of cases.

As to the *prognosis after operation*, the results are generally so excellent that there need be no hesitation in recommending it whenever indicated. "It is beyond question that 99 out of every 100 children from whom adenoid vegetations have been removed

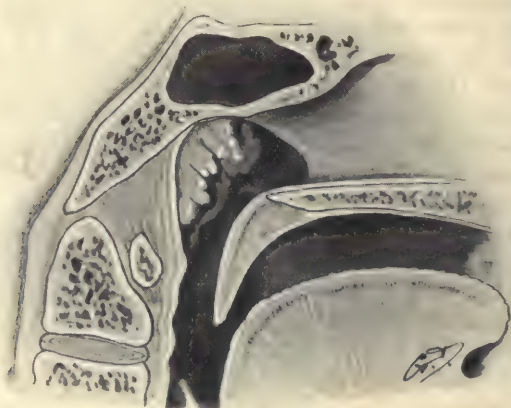


Fig. 182.—Naso-pharynx of normal configuration, with adenoid growths *in situ*. (After Moure.)

improve markedly in every way within a few weeks of the operation" (H. F. Waterhouse).^{*} There are few operations in surgery where the results are so promptly beneficial, and the general and lifelong benefits to the patient are so evident. The dull, flabby, listless and stupid child becomes healthy-looking, bright, and active, and its existence becomes a joy instead of an endurance (cf. Figs. 174 and 175, pp. 322 and 323). When adenoids occur in children who are Mongol idiots, or affected with achondroplasia, care must be taken to give a prognosis with certain reserves. Such children are but slightly benefited by removal of adenoids, while their more prominent defects will be unrelieved.

The risk of contracting infectious disorders is greatly diminished, and if they do occur, they are much less likely to be accompanied

^{*} Quain's "Dictionary of Medicine," p. 1087. London, 1902.

by complications in the nose, throat, or ear.* Improvement of the hearing, when the trouble is simply due to Eustachian obstruction or catarrh, is sometimes noticeable as soon as the patient recovers from the anæsthetic. In all cases of suppurative otitis, local treatment is rendered more satisfactory by the operation.

The beneficial results are more in proportion to the youth of the patient, and the absence of established nasal stenosis, than to the actual size of the growth. It is well, if the operation is

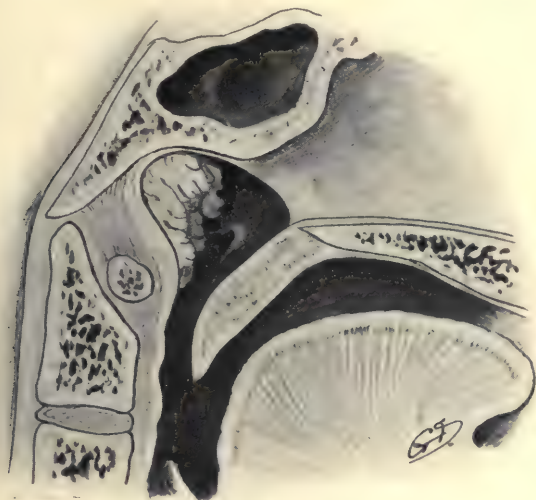


Fig. 183.—Type of naso-pharynx with posterior recess, in which is seen an adenoid hypertrophy. (*After Moure.*)

indicated, that it should be performed before the second dentition. The improved conditions facilitate the proper eruption of the permanent teeth, tend to the development of the upper maxilla and the nasal cavities, and so help to avoid the establishment of a disfiguring facies and figure. The older the patient, once the seventh or eighth year is passed, the less marked are the results. Some years ago I expressed the opinion that it was difficult to estimate how great would be the benefit to the rising generation of the operation for the removal of adenoids.† Many opinions sup-

* Albert Plottier, "Des Végétations Adénoïdes dans leurs rapports avec certaines Maladies Infectieuses de l'Enfance," *Rev. Hebd. de Laryngol.*, 1899, ii., pp. 449-69.

Cottier, quoted by J. D. Rolleston, *Metropol. Asylums Board Ann. Rept.*, 1906. (In 38 autopsies on diphtheria patients, adenoids were found in 50 per cent.)

† *Brit. Med. Journ.*, June 19, 1897, p. 1555.

port this. Thus, J. W. Barrett says: "The fact stands out in the most conspicuous way in my mind that dry catarrh of the middle ear is not as common as formerly; that persistent chronic suppuration of the middle ear is much less common, and that intracranial and sinus infection has become a rare disease." * He also thinks that tonsillotomies are less commonly required, and that operations for enlarged cervical glands are less frequent since the removal of adenoids has become generally recognized.

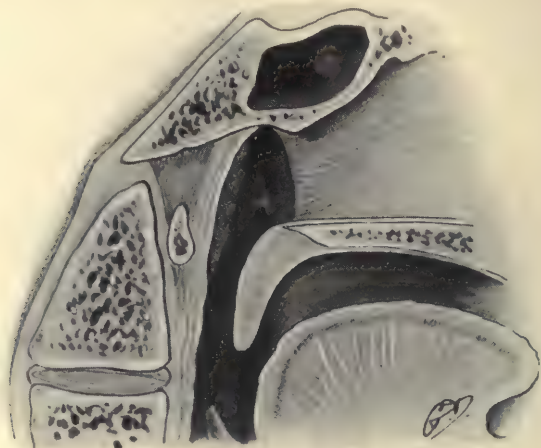


Fig. 184.—Type of narrow naso-pharynx with high arch.

On the posterior wall are some remains of adenoid growth. (*After Moure.*)

Before deciding on an operation, the parents of a patient will frequently inquire what are the chances of recurrence. The adenoid tissue in this space may again hypertrophy under adverse conditions, even after being completely operated. Possibly a re-growth takes place in about 17 per cent. of all cases.† But it can be promised that no recurrence will take place in 90 per cent. of cases of thorough removal, and that the older the patient the less likely is this to happen.

Treatment.—Cases of acute inflammation of the pharyngeal tonsil are treated as described at p. 107, and under the headings of acute rhinitis (p. 125) and acute sinusitis (p. 247). When an hypertrophy in a child causes only chronic catarrhal symptoms, without the appearance of any secondary results, a fair trial

* *Intercolonial Med. Journ. of Australia*, viii., 1903, p. 457.

† Brindel, *Rev. Hebd. de Laryngol.*, 1889, ii., p. 369.

should be given to hygienic and general measures—much open air, regulated diet, with a change to the seaside, and the administration of arsenic, iodide of iron, or cod-liver oil. Of local medicinal measures, the most important is the regular cleaning of the postnasal space with simple, non-irritating nose lotions (Formulæ 8 and 9).

An infant in whom these lotions cannot be used should be laid on its back on a nurse's knee, and, from a clean pipette, 5 to 6 minims of one of the following should be dropped into the nares three times a day:—

℞ Ol. menth. pip. . .	0·5	℞ Iodine . . .	gr. $\frac{1}{4}$
Resorcin . . .	0·25	Camphor . . .	gr. i
Liquid vaseline . .	10·00	Menthol . . .	gr. i
		Liquid vaseline	$\frac{3}{4}$ i

(Menthol preparations may cause dangerous symptoms in children under 3 years of age.)*

Tincture of iodine, 1 to 6 drops, well diluted, may be tried internally three times a day.

When enlarged cervical glands are associated with adenoids, the removal of the latter, although the cause of the glandular trouble, appears sometimes to stimulate suppuration of the glands. If arsenic is given for a few weeks beforehand, such an occurrence will generally be avoided.†

Breathing exercises with the mouth closed (p. 342) may be of service in the slight forms—those which may make themselves noticeable by occasional catarrhal attacks. If the nasal obstruction is established, these forced exercises are apt to do more harm than good (*see* Fig. 60, p. 96).

Operative treatment. *Anæsthesia.*—In adults the operation might be successful under cocaine. On the Continent it is often performed without any anæsthetic. In this country the removal of adenoids is seldom attempted except under a general anæsthetic. In subjects over 15 years of age, and where the growth is a well-defined central pad, removal can be satisfactorily performed under nitrous-oxide anæsthesia with or without oxygen, the patient sitting in a dental chair. Some employ chloride of ethyl, both for adolescents and children; but I prefer the administration of chloroform, or a mixture of chloroform and ether, in all cases in children, and in adults when the growth is diffused, or where tonsils or other hypertrophies require removal at the same operation.

* Robert Leroux, *Ann. des Mal. de l'Oreille*, xxxvii., 1911, No. 11, p. 1047; and *La Presse Médicale*, Fév. 7, 1912, No. 11.

† F. J. Steward, *Clinical Journ.*, April 19, 1905.

Preparation.—Much of the anxiety in connexion with the anæsthetic is avoided if the patient is prepared as for any capital operation. Care is also taken that the child is free from any indications of acute catarrh or infectious fever. Suppurating ears should be carefully disinfected for a week or two beforehand. The condition of the teeth may require attention.

Operation.—The patient should lie on a narrow table, close to the right-hand edge, with only a folded towel or low pillow under the head. The surgeon can operate more rapidly and safely if he is armed with a frontal search-light (Fig. 10, p. 15). Failing this, the operating table is placed parallel to a window, with the

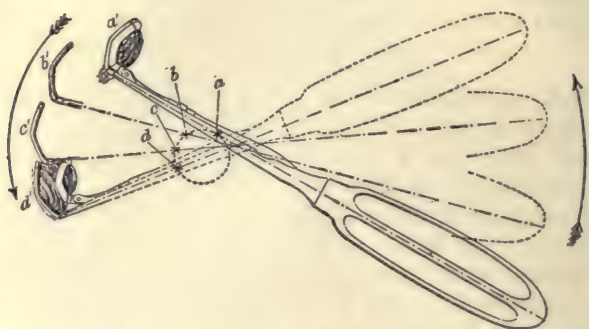


Fig. 185.—The removal of naso-pharyngeal adenoids.

Semi-diagrammatic illustration to show how the curette revolves around an axis which moves from *a*, through *b* and *c*, to *d*. The growth is pressed into the fenestra of the instrument in the *a'* position, and when the sweeping movement has brought it to *d'* it is detached, and caught in the cage. (From the author's article in Burghard's "System of Operative Surgery.")

patient's right hand next the light. Convenient to the operator is his table with instruments, sponges, and iced water. Behind him stands the nurse to assist in controlling the patient or rolling him over on to his right side. The anæsthetist takes charge of the gag, and steadies or rotates the head as required. The anæsthetic is given until the corneal reflex is just abolished, while the swallowing and coughing reflexes are still present; and at this point, if properly given, the administration of the anæsthetic can be discontinued. If the operation is prolonged, more chloroform can be given from a Junker apparatus. The mouth is opened with a gag (O'Dwyer's, Mason's, Doyen's, or Wingrave's). Unless a good view has previously been obtained of the postnasal space, it is well to introduce the forefinger to determine the size and distribution of the growth, or the presence of hypertrophy of the posterior ends of the inferior turbinals. Some form of guarded Gottstein

curette* is then passed into the postnasal space, as shown in Fig. 185. Once the curette is safely behind the soft palate, the operator can do no harm if he keeps the instrument in the middle axis of the body. Firm pressure should be brought to bear on the instrument, which is made to hug the bony walls of the space, and carried through in one stroke. The beak of it is first felt against the posterior edge of the septum, along which it is swept upwards, and then backwards till the cutting edge engages the growth, which it shaves away in its descent along the posterior wall (Fig. 186).

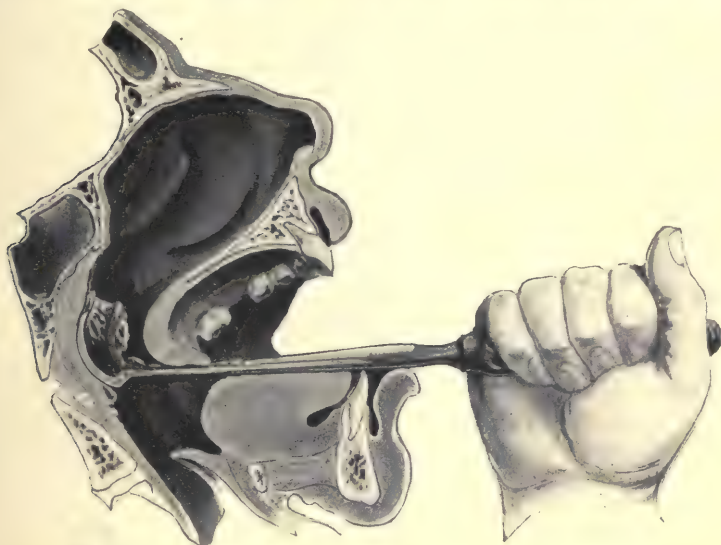


Fig. 186.—Removal of naso-pharyngeal adenoids.

The growth is shown as partially removed from its attachment and bulging into the cage of the instrument, which opens to receive it. (*From the author's article in Burghard's "System of Operative Surgery."*)

The growth is not "scraped" or curetted away. The aim should be rather to shave it off in one mass (Figs. 187, 181, and 173). If it drops from the cage of the curette it should be quickly picked out of the pharynx with a short pair of forceps (Fig. 188). With its removal there is probably a free flow of blood, and the patient should be promptly rotated well on to his right side, with the head low and overhanging the edge of the table. Now, dropping the cage curette containing the removed adenoid mass, the operator quickly seizes an ungarded curette (Beckmann's or Kirstein's), introduces it with the same precautions, and rapidly

* StClair Thomson, *Brit. Med. Journ.*, July 15, 1905. (Description and illustrations of author's caged curette.)

planes down any remaining thickenings on each side of the main mass. In these movements he should always keep in the long axis of the body, working only on the posterior wall. Finally, the curette is laid aside, and the forefinger introduced to ascertain that no thickening remains, that

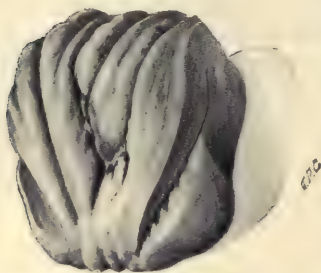


Fig. 187.—Life-size drawing of adenoid growth removed from the girl aged 10, shown in Fig. 61, p. 97. Drawn within an hour from the fresh specimen.

there is no obstruction in the posterior choanæ, and that the fossæ of Rosenmüller have been cleared. Tonsils, if present, are conveniently removed at this stage (*see* p. 390). During this part of the operation the patient may be bleeding freely, but this need cause no anxiety, as nearly all the blood escapes easily from the nose and mouth. No sponging out of the mouth or throat is required, unless the operator feels uncertain as to any dependent "tag" of partially removed growth being left, and requires to make a final careful inspection. The patient is said to lose 2 to 8 ounces of blood, and the bleed-

ing stops spontaneously if left alone. Nothing hastens this cessation better than free sponging of the face and neck with ice-cold water.

The patient should be left on his side, with the face low, until bleeding has practically ceased. When he is lifted back to bed



Fig. 188.—Naso-pharyngeal forceps.

the friends should be warned that he may vomit some of the blood swallowed during the operation. This vomiting may be preceded by some faintness or even collapse.

Difficulties and dangers of the operation.* *The anæsthetic.*—No inconsiderable number of deaths during this operation have been recorded, and almost every one attributable to the anæsthetic. Much

* Grossard et Kaufmann, "Des Complications de l'Adénoïdectomie," Soc. Franç. d'Oto-laryngol., 1911; and *Ann. des Mal. de l'Oreille*, xxxvi., 1911. No. 5, p. 471.

depends on the skill and experience of the administrator; and it is well to secure the services of one accustomed to laryngological work and to the operator's particular methods. He and the operator should agree to co-operate, the latter explaining beforehand to the anæsthetist and nurse how he likes the patient manipulated. The chief danger is from interference with breathing. The simple introduction of the exploratory finger into the naso-pharynx often leads to a cessation of respiration, and the operator should not proceed until it is resumed. Collapse may take place, especially in young or rachitic children, even when no anæsthetic is given,* and has occurred after the patient has



Fig. 189.—Traumatic injury to soft palate, inflicted during operation for removal of adenoids (Dr. Bruce-Porter's patient).

been put back in bed. Patients affected with the "status lymphaticus" are very bad subjects for anæsthetics (*see* p. 317).

Operators differ in opinion, not only as to the most suitable anæsthetic, but as to the depth of anæsthesia desirable. If the patient is in the struggling stage, the difficulties of satisfactory operation are increased, and the risk from aspiration of blood into the trachea may be greater. But profound anæsthesia, especially with deficient admixture of air, appears particularly dangerous to the respiratory centre in adenoid subjects.

Injury to the soft palate.—This may occur from the forceps seizing the uvula in mistake for a semi-detached portion of growth (Fig. 189). If the curette is not safely guided behind the soft palate before any cutting action is made, the uvula may be bruised against the pharyngeal wall or even detached. From experiments on the cadaver,

* Mygind, *Rev. Hebd. de Laryngol.*, xxiii., Oct. 11, 1902.

W. F. Chappell found that it was impossible to rupture the soft palate with the finger.*

The vomer.—The posterior edge of this may be nipped in the forceps, or it may project backwards along the roof of the naso-pharynx, and interfere with complete removal.†

The Eustachian orifice.—I have known of three instances in which the cartilaginous orifice was detached, in one case with the forceps and in the other two with the curette. There was not the slightest ear complication in any case.

Prominent atlas.—This may catch the edge of the curette, which is also occasionally arrested by cartilage, doubtless an enchondrosis of the body of the sphenoid associated with the cartilage of the basilar process of the occipital.‡ It is avoided by not over-extending the head. Indeed, in most cases, a smoother curettage is effected at the junction of the roof and posterior wall of the cavum pharyngeum, if the head is slightly flexed at the moment when the curette is passing over this region.

Stripping off the mucous membrane.—This is more apt to arise when the Loewenberg forceps are used, and the growth, instead of being plucked off, is pulled downwards and peels with it a strip of mucous membrane which may run down into the oro-pharynx.

Hæmorrhage.—Hæmorrhage may be kept up by too vigorous sponging or attempts to stop it. Serious bleeding during or consequent on operation is very rare. Burger has only found in literature the records of four fatal cases, to which he adds one in his own clinic from leukæmia.§ The bibliographical researches of J. W. Barrett and W. F. Orr give the deaths from hæmorrhage as follows: Primary, 5; secondary, 3; hæmophilia, 2 or 4 (the doubt arises because the original references are not given by one author).|| These observers also found references to 36 instances of aberrant pulsating and other vessels in the pharynx, published by Brown Kelly and others.¶ These anatomical irregularities do not appear to have given rise to serious hæmorrhage. In a case of Steward's, from hæmophilia, there was no bleeding from the throat after that at the time of the operation, but death was due to steady and progressive extravasation of blood into the submucous tissues of the pharynx and larynx.** In a boy aged 2½, under Bryson Delavan, there was no unusual loss of blood at the operation, but recurrence took place eight and twelve hours afterwards, and death supervened two hours later.†† The simple examination with the forefinger in an infant may cause an abrasion of an adenoid growth and produce a fatal hæmorrhage.‡‡ The tendency to bleed increases with the age of the patient; the cases in which there is free hæmorrhage are generally over 15 years of age. The

* "Traumatism during Adenoid Operation," *Laryngoscope*, 1902, p. 934.

Med. Rev. of Reviews, 1902, No. 11.

† Grünwald, *Internat. Centralbl. f. Laryngol.*, 1897, No. 2.

‡ Roth, *Wien. klin. Woch.*, Dec. 24, 1896.

§ Kahn, *Rev. Hebdom. de Laryngol.*, 3 Avril, 1897.

|| H. Burger, *Presse Oto-Laryngol. Belge*, 1904, No. 4.

¶ *Intercolonial Med. Journ. of Austral.*, xi., 1906, p. 666.

¶¶ *Glasgow Med. Journ.*, Jan., 1898.

** F. J. Steward, *Lancet*, Nov. 15, 1902.

†† H. Bryson Delavan, *N.Y. Med. Journ.*, Nov. 19, 1892.

‡‡ Hooper (quoted by Delavan).

most common cause is incomplete operation, i.e. the leaving of semi-detached portions of growth. The possibility of hæmophilia should always be kept in mind, and when this dyscrasia or leukæmia is discovered beforehand, no operation should be undertaken until the coagulation-index of the blood has been repeatedly taken and the effect of lactate of calcium observed.

If bleeding continues when the operation has been completed, the patient should be kept quiet, in a cool and well-ventilated room, with ice to suck and iced cloths on the face and neck. If the pulse remains rapid and the child looks collapsed, a hypodermic injection of morphia (about $\frac{1}{12}$ gr., with atropine $\frac{1}{200}$ gr.) might be given with benefit. A few drops of adrenalin can be trickled into each nostril and allowed to run backwards. Lactate of calcium (gr. x-xxx) might be given, and collapse met with a saline injection into the rectum. It is rarely that the postnasal space requires plugging (p. 85).

Hanging portions of growth.—Pieces of adenoid tissue are sometimes separated from the roof of the pharynx, and left hanging by strips of mucous membrane. These cause much irritation and discomfort, and, if left till they slough away, may give rise to an offensive odour from the breath. They can readily be removed by slipping the loop of a nasal snare under them, or by seizing them with Hartmann's conchotome or Luc's forceps (Fig. 114, p. 234), while their pedicle is fixed against the posterior pharyngeal wall with the extremity of the tongue-depressor.

Other methods of operating.—The position with the extended head over the edge of the table has no advantages. It increases congestion, narrows the access to the naso-pharynx, and interferes with the act of swallowing. The Trendelenburg position is an unnecessary complication.

The use of the finger-nail to break up the adenoid mass is now generally abandoned as unsatisfactory.

Loewenberg's forceps entail greater risk of damage to the uvula or Eustachian tubes (*see* Fig. 189). A small pair may be of service in the shallow postnasal space of little children (Fig. 188).

Treatment after operation.—The patient should be kept in bed for a day, and allowed to suck ice. The diet for the rest of the day should be limited to cold soup and iced water or lemonade. Milk is apt to upset the stomach. As a good deal of blood and mucus has inevitably been swallowed during the operation, an aperient is given within twenty-four hours, otherwise a coated tongue and foul breath become noticeable. Local treatment is better avoided; in a few hours any clots may be blown out down the nose, but cleansing lotions appear to retard healing, and add to the risk of ear complications. However, they may be carefully sniffed up the nose if there is much muco-purulent secretion. The child is generally up the next day, and out in three or four days; but at least ten days will elapse before the wound has healed over. If the windows are kept open day and night, and the child is taken out of doors as soon as advisable, it is remarkable how quick is recovery and healing.

Complications after operation.—The one most usually feared is *otitis media*, with its mastoid or other sequelæ. This is generally attributed to the use of nose lotions, but it will occur occasionally in the absence of any local treatment, and after the most carefully

executed operation. A chronic otorrhœa may be aggravated. The *treatment* is that of ordinary acute otitis media—warm fomentations, relief of pain, and the disinfection of the external auditory meatus with 1 in 40 carbolic lotion. If fluid collects in the tympanic cavity, or its exit is inadequate, a free incision through the drum membrane is made under nitrous oxide gas. **Stiff neck**, or **torticollis**, may be complained of for a few weeks. It may be due to over-extension of the head during the operation, or to some slight absorption into the cervical glands. It may last a few weeks in spite of massage, the use of liniments, and the administration of salicylates. Septic bronchopneumonia may be due to fragments of growth being aspirated into the bronchi during operation.*

After-treatment.—In a large number of cases the resiliency of youth is sufficient to secure to the patient all the benefits of the operation, as soon as he resumes a healthy life. In some instances the good effects are lost or minimized owing to a neglect of some after-care. Ear symptoms should now be treated with more particular attention, so as to secure the full benefit of the operation. It is not well to begin inflation (Poltizerization) for a week or two, from the risk of driving septic matter into the middle ear; but after that interval it should be carried out regularly until the improvement it secures is permanent. Suppurative otitis media should now be attended to still more carefully.

Any hypertrophy in the nose should be watched, and, if it does not diminish, may require attention. The long disused *alæ nasi* do not always resume activity spontaneously, and hence may require massage, breathing exercises (p. 100), or the use of rubber tubes for a short time daily (p. 118). A more natural way of restoring nasal respiration is to send the child to the seaside or country, with directions that he should walk uphill, run, skip, or indulge in any suitable games, while keeping the mouth closed.† He should no longer be loaded with clothes, or generally coddled, and should sleep with the window wide open.

Some preparation of iron or arsenic will help in his restoration to vigour.

* J. Guisez, Soc. Franç. d'Oto-laryngol., 1912; and *Ann. des Mal. de l'Oreille*, xxxviii., 1912, No. 11, p. 480.

† Alice R. James, "Ball Games and Breathing Exercises," London, 1908. Percy Lewis, "A Manual of Medical Exercises," 2nd ed. London, 1910.

CHAPTER XIX

TUMOURS OF THE NASO-PHARYNX

INNOCENT TUMOURS

NEITHER simple nor malignant neoplasms are found, except rarely, in the postnasal space. The innocent growths are so uncommon that every new formation in this region should be looked on with suspicion.

A papilloma has been met with as large even as a hen's egg.* Adenomata and cysts (chiefly in connexion with involuting adenoids) may occur.† They can generally be removed under cocaine, with a wire snare introduced through the nose, aided with the operator's left forefinger in the postnasal space, as in Fig. 79, p. 138. The postnasal forceps or adenoid curette will frequently be of service.

A simple fibroma is sometimes encountered hanging down in the postnasal space. It is really a nasal growth, and usually springs from the neighbourhood of the posterior end of the middle turbinal. It is removed under cocaine, with a wire snare introduced through the nose, aided with the forefinger in the postnasal space (*see* p. 135).

NASO-PHARYNGEAL POLYPUS

Synonym.—*Choanal polypus* ; *naso-antral polypus* ; *benign naso-pharyngeal polypus* ; *postnasal polypus*.

This simple growth is usually unilateral and solitary. It is classed here for clinical convenience, but it really originates in the maxillary sinus.

Etiology.—A single polypus in the naso-pharynx originates as a simple antral polypus. This in its growth passes into the nose through an accessory ostium maxillare—which Killian has sometimes found to

* D. Newman, *Proc. Laryngol. Soc., London*, v., 1893, p. 62.

† Jonathan Wright, "A Cyst of the Naso-Pharynx and a Cyst of the Oro-Pharynx," *N.Y. Med. Journ.*, Dec. 7, 1895.

Walter F. Chappell, "Four Unusual Tumours of the Naso-Pharynx," *Trans. Amer. Laryngol. Assoc.*, 1904, p. 217.

Richard H. Johnston, "Cysts of the Naso-Pharynx," *Annals of Otol.*, xvi., June, 1907, No. 2, p. 297.

be as much as 1.7 to 2.2 c. in diameter—and then descends backwards into the postnasal space.*

Pathology.—A choanal polypus is pear-shaped, the broad end lying in the naso-pharynx, while the stalk extends up to and through the accessory ostium maxillare. The broad end of the polypus is often occupied by a large cystic space, which may extend up through the stalk right into the maxillary sinus. Histologically these polypi hardly differ from the ordinary nasal polypi. The rounded end, presenting in the naso-pharynx, is usually firm and of a whitish appearance. If the polyp inflames, it becomes very red, swollen, and covered with fetid purulent mucus, and, at points, with false membrane. Rupture of the cystic spaces with spontaneous expulsion of the whole mass has been observed. These polypi are subject to inflammatory changes which may terminate in partial or total gangrene. In rare cases a choanal polypus might originate in the sphenoidal sinus or a posterior ethmoidal cell (Plate III., Fig. 2, facing p. 124).

Symptoms.—The symptoms are those caused by one-sided nasal obstruction and catarrh (*see* p. 92). There is increasing discomfort as the polypus descends into the pharynx. When the maxillary sinus is opened in these cases it is nearly always found to be filled by a cyst, with a slight degree of chronic inflammation, and slightly mucoid but rarely purulent secretion.

Examination.—Through the anterior naris, with the aid of cocaine, the greyish, jelly-like stalk of the polyp may be seen passing backwards. With posterior rhinoscopy the uniformly rounded, smooth end will be seen, sometimes greyish-blue in colour, or white and opaque. With a probe the polyp will be found soft and movable, free from attachments in the naso-pharynx or elsewhere, except towards the choana.

Diagnosis.—The above appearances, together with the history of a slowly increasing unilateral obstruction, and the absence of spontaneous epistaxis or enlarged glands, will distinguish the polypus from innocent or malignant neoplasms.

Prognosis.—Once removed, the polypus shows no tendency to recur, though some observers hold that recurrence is common unless the antrum is treated.

Treatment.—Under cocaine and adrenalin removal can effectively be done with the cold snare. The wire loop is introduced through the nostril and passed over the body of the polypus. If necessary, this is facilitated by introducing the left forefinger into the postnasal space (Fig. 79, p. 138). The loop is then threaded upwards and inwards close to the spot where the stalk comes out

* Killian, *Lancet*, July 14, 1906, p. 81. †

A. Brown Kelly, *Lancet*, Jan. 9, 1909.

Paul Violette, *Rev. Heb. de Laryngol.*, 1909, ii., p. 161. ‡

I. Kubo, *Ann. des Mal. de l'Oreille*, xxxix., 1913, No. 11, p. 405; and *Proc. XVIIth Internat. Cong. Med.*, London, 1913, Section xv., part ii., p. 423.

of the antrum. The loop of the snare is carefully tightened, so as not to cut through the pedicle but simply to close on it firmly. When the instrument is felt to be grasping the stalk, and a certain resistance is offered, it should be torn out by a steady pull. In this way the portion of the stalk situated inside the antrum is removed, and may be found to be 3 or 4 cm. long. It may show a groove of constriction, because a choanal polypus must in reality have the form of a constricted sac, of which one dilatation is in the antrum, and the other in the nose and naso-pharynx. This sac ruptures during extraction, and a large quantity of sanguineous serum escapes, while more will flow out, from the antrum, when the patient inclines his head forwards.

If it is found difficult to get the wire loop well round the growth, the latter should be steadied with the left forefinger in the post-nasal space, while a pair of polypus forceps is introduced through the nostril, so as to seize the pedicle and tear it away with a quick movement of avulsion. In some cases it is simpler to approach the polypus through the mouth, with a bent snare or a pair of postnasal forceps (Fig. 188, p. 338).

No after-treatment beyond a simple cleansing alkaline lotion is required, but the condition of the antrum should be investigated, and it may be necessary to open it through the canine fossa, as described on p. 269. This may have to be done even although the sinus—as it may be in this affection—is quite clear on trans-illumination, or even brighter than on the affected side (Brown Kelly); but this opening of the maxillary sinus should be reserved for cases of recurrence.

FIBROMA OF THE NASO-PHARYNX

Synonyms.—*Naso-pharyngeal polypus; fibroid tumour of the pharynx; fibroid tumour of the base of the skull; fibro-angioma of the naso-pharynx; retromaxillary polypus; juvenile sarcoma of the naso-pharynx* (Grünwald).

Definition.—These growths are histologically benign, but clinically malignant. They must be distinguished from tumours originating in the nose and passing into the naso-pharynx. They are comparatively uncommon in this country. Paget tells us that he never had an opportunity of examining these growths in a fresh state.* Delavan says they are certainly very rare.†

Situation.—The tumour may originate from any part of the fibrous tissue of the naso-pharynx—the basilar fibro-cartilage, the surface of the basi-sphenoid, the inner surface of the upper

* "Lectures on Surgical Pathology," 3rd ed., p. 474. London, 1870.

† *Laryngoscope*, xiv., 1904, p. 44.

part of the internal pterygoid process, or the front of the bodies of the upper cervical vertebræ. They are also said to arise from the fibro-cartilage in the foramen lacerum medium, the petro-occipital suture, or the pterygo-maxillary fossa. The most common situation appears to be from the periosteum over the sphenoid bone, just behind the roof of the choanæ, and generally to one side. Escat has noticed that the majority of cases originate on the left side.* Indeed, some observers are convinced that these fibromata primarily originate in the spheno-ethmoidal recess of the roof of the nose, whence they invade the ethmoid region, the sphenoidal sinus, and the naso-pharynx.† This origin would lend support to the recommendation to attempt removal through the anterior nares or from the outside through the root of the nose.

Size.—They may vary from the size of a nut to that of a man's fist, or larger.

Etiology.—The cause of these growths is obscure and uncertain, It has been suggested that their appearance depends on developmental irregularities at puberty. They are rare in adults or in girls, and are chiefly met with in boys from the age of 10 onwards to 25. About the age of 23 they show a tendency to disappear, and are rarely met with after 25 years of age, when the development of the skull is completed.

Judging from the greater frequency with which reference to them is made in foreign literature, they would appear to be more commonly met with in France, Germany, and America.‡

Pathology.—The growth consists almost entirely of pure fibrous tissue. This is very rich in blood-vessels, of which the wall is sometimes formed, as in sarcomata, of simple embryonic elements. This explains the great tendency to hæmorrhage mani-

* *Arch. Internat. de Laryngol.*, xxviii., Sept.-Oct., 1909, p. 61.

† M. P. Jacques, *Bull. de Laryngol.*, xii., Jan., 1909, p. 28; and *Arch. Internat. de Laryngol.*, Nov.-Dec., 1911.

V. Falgar, *Ann. des Mal. de l'Oreille*, xxxix., 1913, No. 6, p. 538.

‡ Dieffenbach, "Chirurgische Erfahrungen," dritte und vierte Abtheilung, p. 236. Berlin, 1834.

Nélaton in Botral, "D'une Opération Nouvelle dirigée contre les Polypes Naso-Pharyngiens." Paris, 1849.

Chassaignac, "Traité des Opérations Chirurgicales," ii., p. 448.

Langenbeck, *Deuts. Klinik*, 1859, No. 48.

Huguier, *Bull. de l'Académie de Méd.*, Paris, 28 Mai, 1861.

Charles M. Shields, *Trans. Amer. Laryngol. Assoc.*, 1896, p. 95.

Albert C. Getchell, *ibid.*, 1909, p. 50.

R. P. Lincoln, *ibid.*, 1883.

D. Bryson Delavan, *ibid.*, 1901, 1903, and 1911.

Gordon King, *ibid.*, 1903.

E. Fletcher Ingals, *ibid.*, 1896, p. 90, and 1903, p. 132.

C. R. Holmes, *Journ. of Laryngol.*, xvii., 1902, No. 8.

W. Lincoln, *Amer. Journ. Med. Sci.*, Nov., 1901, p. 463.

D. Bryson Delavan, *Laryngoscope*, xiv., Jan., 1904, p. 44.

Chevalier Jackson, *ibid.*, xiv., 1904, p. 267.

A. J. Brady, *Journ. of Laryngol.*, July, 1906, p. 315.

fested by these tumours. Not uncommonly, round cells, which resemble those of fusiform or even embryonic sarcoma, are found between the fibres of dense connective tissue. The base is usually small, but it may have a broad attachment. Besides this attachment of origin, a fibroma acquires secondary insertions through ulceration and adhesion between it and neighbouring surfaces. The tumour does not produce secondary infection of glands, or metastatic growths; but, having filled the space in which it originates, it extends by pressing on and causing atrophy of the parts with which it comes in contact. In this way bones are absorbed, and the tumour not only spreads downwards into the pharynx, but sends processes into the nose, sinuses, orbits, the sphenomaxillary fossa, the pterygo-palatine fissure, and through the base of the skull to the brain. It is rare for it to undergo myxomatous, cystic, fatty, or other degeneration, but it may become definitely sarcomatous. On the other hand, if the patient survives to about the age of 23 or 25, it may undergo spontaneous involution and disappear.*

Symptoms.—In the early stages the chief complaint will be of nasal obstruction and discharge, with headache and epistaxis. With the development of the growth the respiration becomes entirely buccal, the voice assumes the dead, nasal tone of rhinolalia clausa (p. 98), and the epistaxis becomes more frequent and alarming. The sense of smell is destroyed, and consequently that of taste is much diminished. Otagia, deafness, and ear complications arise, while the muco-purulent catarrh from both nose and pharynx is increased.

With further development and invasion of the nose and face, acute neuralgia is set up with agonizing pains in the ear and head. There are epiphora, diplopia, exophthalmos, and compression of the optic nerve. The upper maxilla is bulged outwards by the extension of the growth into the antrum, and the zygomatic and pterygoid fossæ are involved. The invasion of the ethmoid region, together with the broadening out of the bridge of the nose and the bulging of the eyes, brings about the appearance described as "frog-face" (Fig. 190). The discharge from the nose and mouth now becomes more fetid and horribly gangrenous in odour. The growth of the tumour into the pharynx interferes with deglutition and respiration, and with increasing hæmorrhages there is marked anæmia and cachexia. Death results from inanition, choking, sepsis, hæmorrhage, cerebral involvement, or intercurrent affections, unless the age of immunity (the 25th year), with resulting

* E. Fletcher Ingals, *Trans. Amer. Laryngol. Assoc.*, 1899, p. 142.
Henry L. Swain, *ibid.*, 1909, p. 29.

involution, is reached before the growth has advanced to this stage.

From an early stage mental hebetude and marked somnolence are a feature of the disease, and incontinence of urine has been observed.*

There are, in addition, non-typical naso-pharyngeal fibromata* (p. 210).



Fig. 190.—Naso-pharyngeal fibroma, showing the “frog-face” deformity. (Case of Dr. Thomas Stewart.)

Examination.—If attention is directed to the postnasal space while the growth is in an early stage, the rhinoscopic mirror will reveal a smooth, rounded, greyish, pale-pink or reddish tumour, sometimes uneven and lobulated, attached to the roof of the cavum. Exploration with the finger demonstrates that this growth is of a wooden-like hardness, at first movable, but later immobile, and with its point of implantation behind the choanæ (Plate XII., Fig. 3, facing p. 320). If the case only comes under observation at a later stage the changes in the bones of the face may be evident; prolongations may be found extending forward into the nasal chambers, sometimes pushing the septum to one side, and protruding from the anterior nares; the tumour may be dis-

* Fitzgerald Powell, *Proc. Laryngol. Soc., London*, vii., Dec., 1899, pp. 21 and 49.

covered descending behind the palate, which it pushes forwards, to appear in the oro-pharynx ; or it carries the os planum in front of it and causes exophthalmos. Wherever the growth or its prolongations are manipulated, it is apt to bleed. The glands are not affected.

Progress.—The rapidity of growth in these tumours varies in proportion to the amount of sarcomatous structure present. Hence, when they are untreated, death may ensue between 6 months and 3 years. The disease is more rapid in children at or before puberty, but progresses more slowly in those who have reached 18 or 20 years of age.

Prognosis.—This is always serious, and will depend on the size of the tumour, the rate of growth, and the age of the patient. The nearer the patient approaches to the age when involution naturally takes place, the more hopeful is the outlook.

Differential diagnosis.—Nasal polypi sometimes appear in the postnasal space (Frontispiece, Fig. 1) : the fibrous tumour of the nose may grow backwards and be called a “ naso-pharyngeal polypus,” although it takes origin from the posterior ends of the turbinals, generally the middle (p. 210) ; the choanal polypus is unilateral and originates from the lining of the maxillary sinus (p. 343). These may somewhat resemble the tumours under consideration, particularly if the presenting part is distinctly fibrous. Digital exploration will distinguish a fibroma from retropharyngeal abscess or adenoids.

From sarcoma it is more difficult to distinguish it before removal, but the diagnosis is not in this case so important, as the treatment, at least the first step of it, would be the same. Epithelioma is of rare occurrence in adolescents, and generally reveals itself by the early involvement of the glands.

If the growth is fleshy and pinkish, or like macerated flesh, firm to touch, not readily if at all movable, with prolongations into the nose, possibly with facial disfigurement, and with a history of spontaneous epistaxis, then it is a hard, true, naso-pharyngeal fibroma, and it must only be interfered with after due consideration. In settling the diagnosis of naso-pharyngeal fibromata, the risk of starting dangerous hæmorrhage makes it unsafe to remove a portion for microscopic examination.

Treatment.—This may be considered under the following heads : (1) Palliative ; (2) by caustics ; (3) removal after preliminary operations through the nose or face ; (4) removal through the natural channels, without preliminary operations.

1. Palliative or expectant treatment.—If the patient is approaching the age when involution of the tumour naturally takes place,

and there are no urgent symptoms, the nose and pharynx should be kept as clean and antiseptic as possible, and various styptics (adrenalin, hazeline, or peroxide of hydrogen) employed from time to time. The administration of arsenic may prove useful, and the coagulability of the blood may be increased by giving lactate of calcium.

2. **Treatment by caustics.**—Injections of monochloroacetic acid have been used; 3 to 5 minims are injected at a time, and repeated at intervals of two weeks to two months. As many as fourteen injections may be required.*

Puncture with the galvano-cautery should not be employed. It produces a reaction which may only stimulate the activity of the growth, and the separation of the sloughs may set up hæmorrhage or septicæmia. The galvano-cautery snare is, theoretically, very suitable, but in practice it is difficult of management and disappointing.

Electrolysis has the advantage of being harmless, of checking the tendency to hæmorrhage, and of being readily acceptable by the patient. It is therefore worthy of trial as a palliative in cases where the natural involution of the tumour may be expected, where the patient is anæmic from loss of blood, and where surgical removal is declined. Two iridio-platinum needles should be inserted deeply as near the pedicle as possible, and distant from one another from 4 to 20 mm. A current of 10 milliamperes is used, gradually increased up to 40 or 50, but as much as 60 or even 80 has been used. Each sitting lasts about fifteen minutes, and it is important to remember to reverse the current for a few seconds before withdrawing the needles. This prevents any hæmorrhage at the positive pole. The eschar takes from three weeks to a month to fall. Since as many as twenty, forty, or one hundred sittings are required, the treatment may have to be continued for years. Besides, it is not free from the risks of sloughing, with consequent cachexia or serious hæmorrhage.

In fact, all the above methods, which act by producing a slough, may produce a reaction that tends to increase the rapidity of the growth rather than retard it, and such methods are unsurgical, untrustworthy, and unsatisfactory.

3. **Operative removal, after preliminary operations.**—Preliminary operations through the hard palate, the nose, or the superior maxilla are not only disfiguring and unnecessary, but are dangerous without preventing recurrence of the growth. Bryson Delavan has collected statistics which show that this method only cured 59·25 per cent., while 25·9 per cent. died, and 15·4 per cent. had a recurrence. On the other hand, the cases operated on through the natural passages show a death-rate of only 5 per cent. and no recurrences.†

4. **Removal per vias naturales, without preliminary operations.**—The majority of cases are removed by this method. Powerful instruments are required, and it would be useless and

* Harmon Smith, *Laryngoscope*, xv., April, 1905, p. 292.

† Bryson Delavan, *ibid.*, xiv., 1904, p. 44.

dangerous to attack a fibroma with such light instruments as adenoid forceps. Hæmorrhage is diminished if the tumour is removed by a combination of twisting and tearing movements. The more rapidly and completely the growth is cleared away, the sooner will the bleeding cease. It generally stops after complete removal, under firm pressure with a marine sponge. A postnasal plug should be avoided, and is not usually required. Incomplete operations not only set up hæmorrhage, but may start septic absorption.

Attempts to reach the tumour through the anterior nares are generally useless, as, in addition to the risks of hæmorrhage and sepsis, there is the chance of destroying the thinned-out os planum or cribriform plate.

Varieties of procedure.—(a) The ordinary wire snare is unsuitable for operation on this very tough growth. It is impossible to get a loop to hold on to such a broad-based growth, and at best only a part is removed, thus giving rise to hæmorrhage and opening the channels of septic absorption. The same objections hold good for any attempts at piecemeal removal.

(b) When the tumour is large, it should be dealt with in the manner first proposed by Doyen,* and developed by Moure, Delie,† Escat,‡ and others.§ In this method the pedicle of the tumour is directly attacked through the mouth with the specially designed raspatories of Doyen or Escat and the powerful forceps of Lubet-Barbon|| (Fig. 191). The patient is chloroformed and placed in the position of Rose (hanging head), the mouth being propped open, and the tongue drawn forwards. The tumour is first explored with the forefinger, to detect and detach any secondary adhesions. A raspatory which works laterally is next passed from one side of the pharynx to the other, above the growth. A rugine which works in a sagittal plane is then introduced below the tumour and made to pass upwards behind it, the reverse movement to that of a Gottstein curette in the removal of adenoids (cf. Fig. 185, p. 336). This movement is facilitated by securely gripping the tumour and dragging it forwards with a stout pair of alligator or volsella forceps. The tumour can thus be so freed that, with some further twisting and dragging movements, it can be grasped with stout forceps and extracted entire, often dragging with it through the naso-pharynx any prolongations thrown forwards into the nose.

* *Arch. Internat. de Laryngol.*, x., 1897, p. 246.

† *Ann. des Mal. de l'Oreille*, Mars, 1899, p. 330.

‡ "Maladies du Pharynx." Paris, 1901.

§ Irwin Moore, *Proc. Roy. Soc. Med.*, Laryngol. Section, vol. viii., 1915, May 7.

|| Made by Simal, 5 rue Monge, Paris.

(c) Gordon King* has not found it satisfactory to attack the pedicle from the mouth. He employs a pair of scissors with long handles and short blades, and slightly curved on the flat. These are introduced through that nostril which appears to be in most direct line with the pedicle, and are used first as a raspatory, and then for cutting through the base of the growth. He places the patient in the hanging-head position, does a preliminary tracheotomy, and plugs the laryngo-pharynx.

(d) Cases have been treated by Fitzgerald Powell,† Butlin, and Tilley‡ in the following manner, which is both safe and thorough, and allows of deliberate removal. The patient is chloroformed, and a preliminary laryngotomy is performed (p. 773). The soft

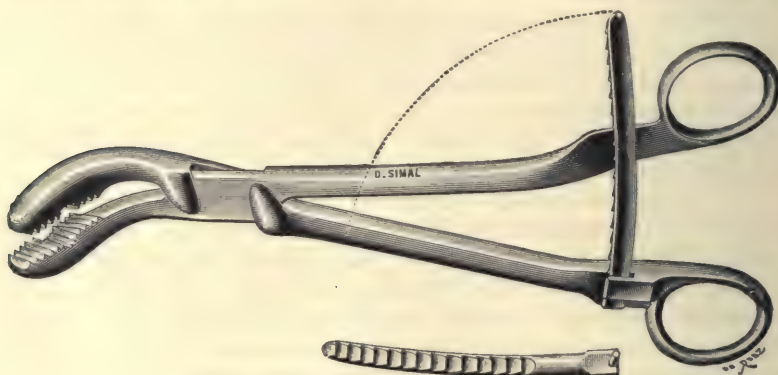


Fig. 191.—Lubet-Barbon's forceps.

palate and uvula are carefully divided in the middle line, and a silk ligature is placed through each lateral half, so that they can be held forward out of the way. This gives more direct access to the postnasal tumour, and if it is still found to crowd the cavity too closely to allow of manipulation, the posterior part of the palate can be chiselled away in the middle line. The patient is then placed in the hanging-head position, and with the help of periosteum detachers, scissors, snares, and strong vulsellum forceps, the growth is torn from its attachment. The divided palate is carefully united in the middle line, and the laryngotomy tube is removed at once.

(e) Brady, of Sydney,§ has been very successful in several cases, by first performing a Moure operation (p. 761) on the side

* *Trans. Amer. Laryngol. Assoc.*, 1903.

† *Proc. Laryngol. Soc., London*, vii., 1899-1900, pp. 21 and 49. (Removal of a tumour weighing $3\frac{1}{2}$ oz. and measuring $8\frac{1}{2}$ inches in circumference.)

‡ *Ibid.*, x., 1902, p. 19.

§ *Journ. of Laryngol.*, July, 1906, p. 315.

where there is a nasal prolongation of the growth. No cutting instruments are used on the growth; a pair of strong vulsellum forceps and Langenbeck's elevator are all that is required (Fig. 191a). The surgeon's left forefinger is used to define the pedicle while the elevator is introduced through the operated nostril to detach it. With the forceps the growth is removed through the mouth by a twisting and tearing movement.

Brady points out the obvious disadvantages of dividing the soft or hard palates.

Conclusions.—Rapidity of operation is important, as all observers are agreed that, once the pedicle has been cut through or the body of the mass removed, the hæmorrhage tends to subside spontaneously or is quickly controlled by packing.

The hanging-head (Rose) or the Trendelenburg position is universally recommended.

A preliminary and temporary laryngotomy adds nothing to the dangers of the case.

It allows of the laryngo-pharynx being packed, so that there is no anxiety in regard to the descent of blood into the lungs, or the steady administration of the anæsthetic through the cannula. The surgeon is thus relieved of two great anxieties, and can devote himself without embarrassment to more deliberate operation.

Division of the palate should if possible be avoided. It does not always unite, and is less likely to do so if subsequent operations are required. The soft palate is very elastic and yielding, and in some cases it can be tied out of the way by means of a soft rubber catheter passed along the floor of the nose and out through the mouth. In a few cases it may be necessary to open the nose by a Rouge's operation (p. 760), or the nose and antrum by a Denker operation (p. 273), or to excise part of the upper jaw.

Ligature of the external carotid, recommended by Chevalier Jackson,* is not necessary unless the patient is very weak or anæmic from former hæmorrhages.

The preliminary use of adrenalin and cocaine, the administration of lactate of calcium, and the other methods recommended for the prevention and treatment of bleeding (p. 83), should be carefully attended to. But in every case preparation should be made

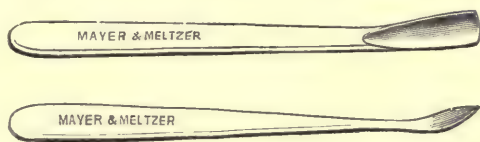


Fig. 191a.—Langenbeck's elevators.

* *Laryngoscope*, xiv., April, 1904; p. 267.

beforehand for ligature of the external carotids and for saline transfusion.

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 Max Jordan, *Munch. med. Woch.*, 1908, No. 21.
 Escat, *Arch. Internat. de Laryngol.*, 1900, p. 89.
 U. Melzi, *Journ. of Laryngol.*, Aug., 1903, p. 403.
 Vaquier, *Arch. Internat. de Laryngol.*, xvi., 1903, No. 3, p. 404.
 Chavasse, *ibid.*, xv., 1903, No. 1, p. 10.
 Viollet, *Bull. de Laryngol.*, v., 4^{me}, Dec. 30, 1902.
 J. A. Stucky, *Laryngoscope*, xiii., July, 1903, p. 538, and Nov., p. 861.
 J. Boulay, *Arch. Internat. de Laryngol.*, xv., 1902, p. 107.
 Fletcher Ingals, *Trans. Amer. Laryngol. Assoc.*, 1903, p. 132.
 Bryson Delavan, *ibid.*, p. 135.
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 Sargnon, *Gaz. des Hôp.*, Nov. 27, 1897.

MALIGNANT TUMOURS

SARCOMATA AND EPITHELIOMATA

Etiology.—Primary malignant disease of the naso-pharynx is rare. Sarcomata may occur early in life, and are said to be not uncommon in women under 30.* Endothelioma is met with more rarely, but has been recorded in a girl of 17.†

Symptoms.—Nasal obstruction is not a striking symptom in the early stages, when the usual ones are deafness of the type produced by Eustachian obstruction and local pain.‡ This latter is usually diagnosed as trigeminal neuralgia. Abnormality of the soft palate with œdema in it and the adjacent pharyngeal will appear sooner or later. In more advanced cases the chief local symptom is nasal obstruction, otherwise the symptoms are similar to those of fibroma (p. 347), but with an earlier onset of epistaxis. Not uncommonly the secondary effects of the growth are marked before nasal obstruction is complained of. In this way headache, earache, otorrhœa, or affections of the eye may first be complained of, or a lump in the neck may be so large as to be operated on as a primary malignant growth, since the symptoms may not be marked enough to direct attention to the true origin in the naso-pharynx.

Examination.—A sarcoma is found to be irregular, lobulated, greyish, or pinkish-white, and may be soft to the touch. An epithelioma is seen to be dark purple-red, and irregular, and to the finger is characteristically hard. (Plate xiv., Fig. 3, facing

* E. B. Waggett, *Proc. Laryngol. Soc.*, London, vii., Nov., 1899, p. 11.

† Thomas Guthrie, *Journ. of Laryngol.*, xxvi., 1911, No. 9, p. 449.

‡ Citelli, *Zeit. f. Laryngol.*, Bd. iv., Heft 3; and *Journ. of Laryngol.*, xxvii. No. 9, p. 515.

p. 442.) The secondary glands in the neck generally appear early, and are hard and fixed.

Diagnosis.—Sarcomata may be multiple and occur in the tonsillar and postnasal regions in adults, so as to simulate ordinary tonsils and adenoids.* In suspicious cases a small portion of the growth can be nipped off for microscopic examination. Cases of epithelioma are generally revealed by the free bleeding on being touched, and the early implication of the glands.

Prognosis is extremely grave. After operation recurrence is rarely delayed longer than fifteen months.†

Treatment.—In cases of sarcoma a good trial should be given to large doses of arsenic. If a growth is not too extensive, spreading to the walls and glands, an attempt at removal might be carried out in the same way as for fibroma (p. 350). The operation of Moure is excellent for giving access to the naso-pharynx (pp. 761 and 762). The enlarged glands are not always malignant, but may be affected with chronic lymphadenitis.‡

The use of radium and diathermy is considered on p. 224. Amongst palliative measures tracheotomy has frequently to be performed, and gastrostomy may be required.

* W. R. H. Stewart, *Proc. Laryngol. Soc., London*, i., 1893, p. 6.

† W. Trotter, *Proc. Roy. Soc. Med., Section of Otology*, Feb. 17, 1911.

‡ See Stewart's case.

Scanes Spicer, *Proc. Laryngol. Soc., London*, vii., Nov., 1899, p. 11.

CHAPTER XX

POSTNASAL CATARRH

Synonym.—*Naso-pharyngeal catarrh.*

Postnasal catarrh is, in the majority of cases, only a symptom of disease in the nose or its accessory cavities. In certain instances it may simply be the participation of the postnasal space in catarrhal affections of the pharynx. But the affection may also be primary, and either acute or chronic.

Acute postnasal catarrh not only forms part of the invasion of acute coryza, but the postnasal space is frequently the first site of infection (p. 101). In acute sinusitis, particularly of the posterior group of cavities, the mucosa of the postnasal space is acutely inflamed. The condition subsides with the disappearance of the acute catarrh (Plate XII., Fig. 2, facing p. 320).

CHRONIC POSTNASAL CATARRH

Etiology.—The origin of catarrh in the postnasal space must first be sought in the nose and its accessory sinuses, and then in affections of the pharynx (Plate III., Fig. 3, facing p. 124). Of pharyngeal causes, the one most likely to cause symptoms in the postnasal space is gastro-intestinal disorder. Dust, alcohol, and tobacco are the three most potent forces in causing or aggravating primary catarrh at the back of the nose, and it is possibly on account of their greater exposure to these agencies that men are so much more subject to the trouble than are women. In the postnasal space itself the catarrh generally originates from Luschka's tonsil. The adenoid collections which should have undergone normal involution at puberty are found to have only partially atrophied (Fig. 172, p. 318). They are seen still to exist in the form of a diffuse, rough, or ridged elevation in the dome of the cavity, secreting a tenacious muco-purulent discharge. This irregular surface is sometimes studded with small white patches, as in the lacunar infection of the palatine tonsils (p. 377); or the cysts which are met with in the pharyngeal tonsil may communicate with the surface and yield a particularly offensive and scabby

secretion. In other cases these adenoid remains may present two or more clefts or sulci in which secretion stagnates; or the pouch of Rathke may persist as a single, central recess, the bursa pharyngea. When this yields much tenacious discharge the name of "Tornwaldt's disease" has been given to the condition.*

There is another form of essential postnasal catarrh in which no trace remains of the pharyngeal tonsil, and the mucosa covering the posterior wall is dry, glazed and particularly thin-looking. In such cases it is often very difficult to trace the origin of the dirty greyish-yellow secretion, often darkened by dust, which collects there. (*See Atrophic Pharyngitis*, p. 435.)

In some cases the atrophy and catarrh would appear to be the legacy of some syphilitic process in the nose or postnasal space.

Symptoms.—The patient is apt to complain bitterly of the discomfort at the back of the nose, which impels him to be constantly hemming and hawking. In the morning his efforts to remove dried secretion are apt to produce retching and vomiting, and the life of a sufferer from this complaint is often made more miserable than it would be by many a more serious affection. From irritation, sepsis, or direct extension there may in addition be symptoms in the pharynx, larynx, or elsewhere (p. 92).

Diagnosis.—If caused by the pathological changes above described the diagnosis will not be difficult. Inspection of the nasal chambers will reveal any source of catarrh there. But it frequently requires a long and careful examination to exclude the possibility of the catarrh originating in the accessory sinuses. Suppuration in the posterior ethmoidal cells or sphenoidal sinus is usually accompanied by a backward flow of pus, but it is important to remember that the secretion from a diseased antrum or frontal sinus may never soil a pocket-handkerchief or cause other obvious inconvenience than that of postnasal catarrh. No patient should be condemned to the diagnosis of essential postnasal catarrh until the possibility of its origin in the accessory sinuses has been excluded.

Prognosis.—Chronic, primary, postnasal catarrh, if caused by affections of Luschka's tonsil, will be cured or relieved by local treatment. When secondary to sinus disease, the cure will depend on the successful diagnosis and treatment of the primary condition. The primary form, unassociated with disease either in the sinuses or in the pharyngeal tonsil, is apt to be very obstinate, although treatment and constant attention will greatly mitigate its

* T. Carwardine, *Bristol Med.-Chir. Journ.*, Dec., 1897.

H. W. Meyer, *Trans. Internat. Med. Cong.*, London, 1881, iii. 2788.

discomforts. The prognosis of descending infections in the pharynx and larynx will of course vary with that of the postnasal catarrh.

Treatment.—If the catarrh originates in the nasal sinuses, these are systematically treated (p. 303). Tornwaldt's affection, or any diseased remains of adenoids, should be carefully and completely removed.

In true postnasal catarrh the local and general treatment indicated in the chapters on Catarrh (p. 107), Chronic Rhinitis (p. 129), and Chronic Pharyngitis (p. 432) should be consulted. Locally it is most important to keep the region very clean by the use of simple, tepid, alkaline nose-lotions (Formulæ 8 to 12). The secretion may be prevented from adhering by following the watery lotion with an oily spray (Formulæ 66 to 69). The mucosa of the space can be made healthier by swabbing it with Mandl's solution (Formula 71), glycerin and borax, boroglyceride, menthol (Formula 74), or resorcin (Formula 72). These paints are generally more successful than the astringents which are usually recommended, but an occasional application of nitrate of silver (gr. x-xxx to ʒi), or argyrol (25 per cent.), may prove useful.

General treatment will include attention to the causes already mentioned, as well as to those referred to in the chapter on Catarrh (p. 107). Climate seems less important than the manner of living. Dusty and overheated rooms, abuse of alcohol, tobacco, and the pleasures of the table, must be avoided. Relief, if only temporary, is sometimes secured by small doses of iodide of potassium, ipecacuanha, chloride of ammonium, or other drugs which promote secretion (Formula 52, p. 809).

The chronic essential form is frequently benefited by a course of treatment at Harrogate, Ems, Mont Dore, Cauterets, Aachen, Aix-les-Bains, or other suitable health resort.

Fig. 1.—Pharyngeal thrush. (*See* p. 417.)

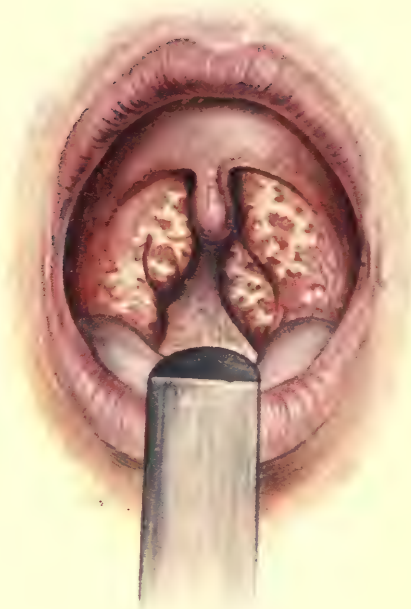
Fig. 2.—Acute lacunar tonsillitis. (*See* p. 367.)

Fig. 3.—Mucous patches of the fauces and tongue. (*See* p. 674.)

Fig. 4.—Postsyphilitic defects and scars in the pharynx. (*See* p. 682.)

(*From Grünwald's "Atlas and Epitome of Diseases of the Mouth, Pharynx, and Nose."*)

PLATE XIII.



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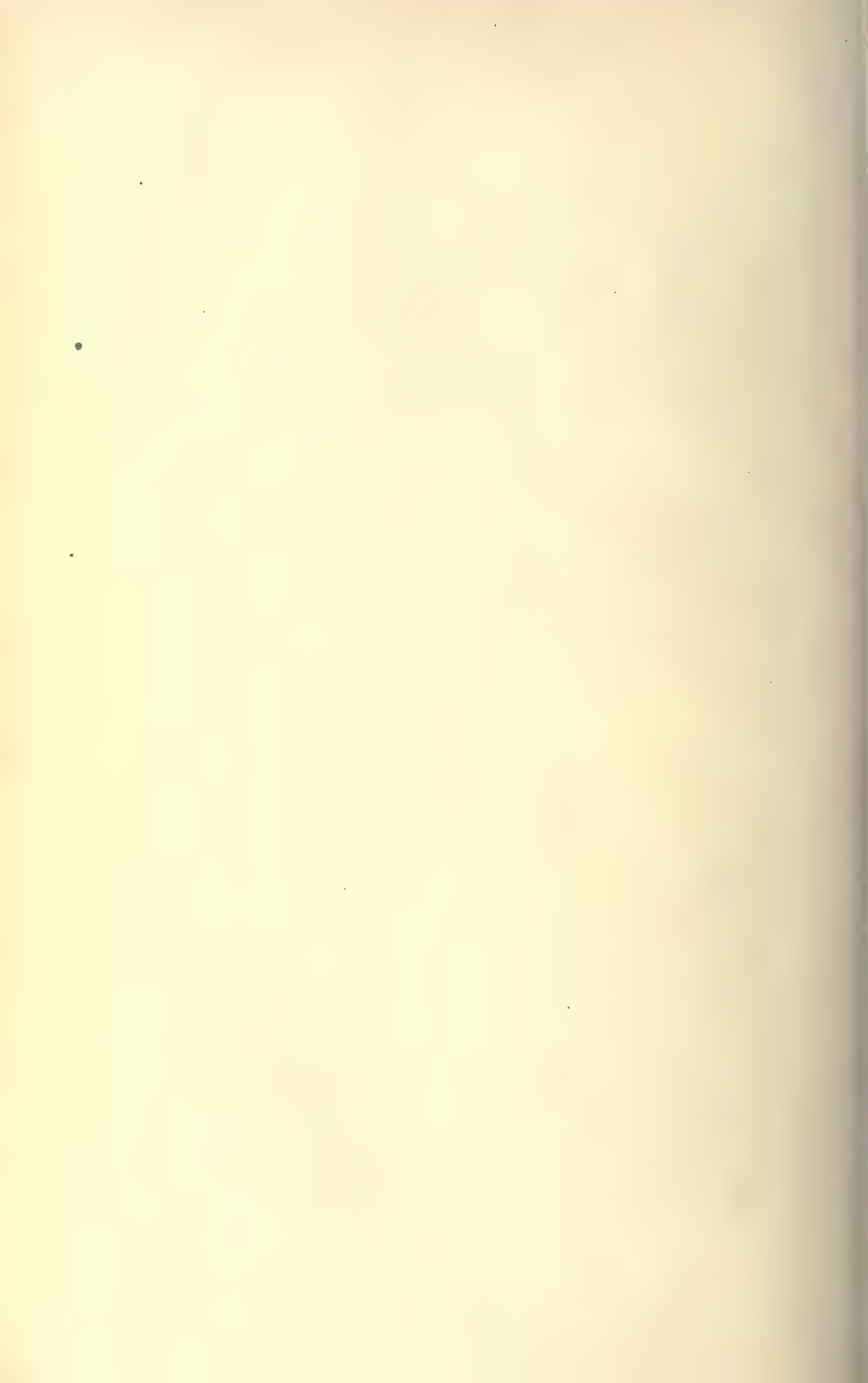


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PLATE XIII.



PART V.—DISEASES OF THE PHARYNX AND TONSILS

CHAPTER XXI

THE PHARYNX

THE technique of examination will be found described at p. 24.

Anæmia of the pharynx, most marked on the soft palate, is present in cases of general anæmia, and is often noticeable in tuberculosis of the larynx. (p. 635).

Hæmorrhage from the pharynx is not common, and cases where bleeding is said to come from the throat should always be viewed with the suspicion that it may be of pulmonary origin. It is said to occur in diseases of the vascular system—hæmophilia, purpura, leukæmia, and scurvy; or in those which retard circulation—heart disease, cirrhosis of the liver, granular kidney, or emphysema. Locally, of course, it may accompany suppuration, ulceration, or the results of operation. Varicose veins in the pharynx or at the base of the tongue, adenoids, and spongy gums may yield a little blood. (*See* Hæmoptysis not of pulmonary origin, p. 459.)

ANATOMICAL ABNORMALITIES

For the description of pharyngocele, or pharyngeal diverticulum, *see* Oesophageal Pouch, p. 605.

Large vessels may very rarely be seen pulsating on the posterior pharyngeal wall—probably large ascending pharyngeal arteries or tortuosities of the internal carotid.*

Perforations in the anterior pillars of the fauces may be left by measles or scarlatina, but in many cases the symmetry and absence of cicatrices around these fenestrations suggest a congenital origin (Fig. 192).†

* A. Brown Kelly, *Glasgow Med. Journ.*, Jan., 1898 (with list of references).
Edington, *Brit. Med. Journ.*, Nov., 1901.

J. G. Connal, *Journ. of Laryngol.*, xxiii., 1908, No. 3, p. 130.

† T. Hubbard, *Laryngoscope*, xii., Oct., 1902, p. 748.

Broeckaert, *Presse Oto-Laryngol. Belge*, 1902, No. 9.

P. Watson Williams, *Lancet*, Jan. 25, 1908.

Percy Fridenberg, *Laryngoscope*, xviii., July, 1908, p. 567.

The posterior pillars may be found adherent to the posterior pharyngeal wall, leaving only a small opening leading up to the postnasal space.* Although very symmetrical, there is sometimes a history of severe scarlatina.†

The uvula may be more or less completely bifid (Fig. 193).

Insufficiency of the soft palate is a rare condition. It was described by Lermoyez in 1892.‡ The soft palate is of normal

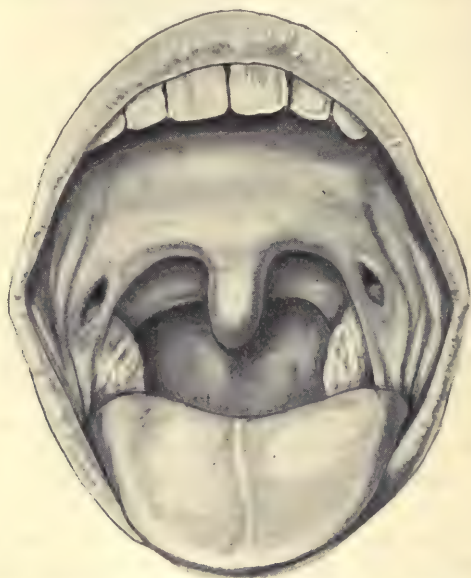


Fig. 192.—Fenestration of pillars of fauces.

length, but a shortening of the hard palate prevents it from reaching the posterior wall of the pharynx during phonation.§ The earliest efforts at speech may have a nasal tone, but this defect tends to disappear with age. It is apt to be associated with chronic catarrh of the postnasal space and Eustachian tubes. Brown Kelly has seen 5 cases of insufficiency of the palate, and in all of them the ears were, or had been, affected.||

* S. Oppenheimer, *Laryngoscope*, xviii., July, 1908, p. 580.

† Fitzgerald Powell, *Proc. Laryngol. Soc., London*, v., June, 1899, p. 116.

‡ *Ann. des Mal. de l'Oreille*, 1892, No. 3, p. 161.

§ Castex, *Gaz. Méd. de Paris*, Jan. 15, 1898.

M. Philip, *Ann. des Mal. de l'Oreille*, xxxii., Dec., 1904, p. 597.

A. Brown Kelly, *Journ. of Laryngol.*, xxv., 1910, Nos. 6 and 7, pp. 281 and 342.
(Very complete, well-illustrated article, with full bibliography.)

Leonard Guthrie, *Proc. Roy. Soc. Med., Section Children's Diseases*, iv., Nov., 1910, p. 23.

|| *Trans. Otological Soc., United Kingdom*, v., May 21, 1904, p. 91.

It has been proposed to treat it by vocal exercises, and the submucous injection of paraffin into the posterior pharyngeal wall.*

DISEASES OF THE UVULA

The uvula is subject to those disorders affecting the pharynx generally—acute and chronic inflammation, innocent and malignant growths, and chronic infective diseases such as syphilis and lupus. It is practically a part of the soft palate (Fig. 194).

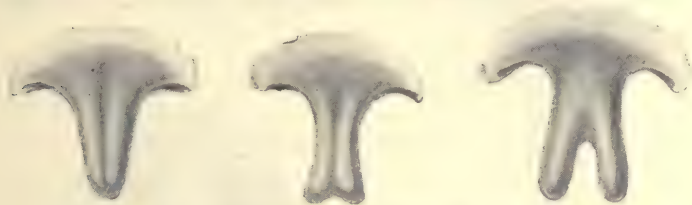


Fig. 193.—Anatomical abnormalities of the uvula.

Three degrees of bifid uvula.

In acute inflammation of the pharynx the uvula sometimes bears the brunt of an attack. If it is oedematous it can be freely scarified.

ELONGATED UVULA

The uvula, as a result of chronic inflammation, may become attenuated and elongated, the muscular structures being thinned out, and the translucent mucous membrane extending some distance beyond. Or the uvula is not only longer than usual, but is hypertrophied, rugose, and chronically congested (Fig. 195). The symptoms popularly ascribed to a "relaxed" uvula are, in the majority of cases, caused by the concomitant condition of the soft palate, or by the postnasal and pharyngeal catarrh to which the elongation is frequently due. In many cases an elongated uvula causes no symptoms whatever. In others there is local discomfort, the sensation of a foreign body, constant hemming and hawking, nausea and vomiting after meals or when the throat is examined, alteration of voice, and laryngeal spasm. A paroxysmal cough is often persistent, and is apt to be increased on lying down. These symptoms are generally more marked in thickset men with a tendency to emphysema, and addicted to tobacco and alcohol.

Treatment.—This should be directed not only to all the upper air-passages, but also to the lungs and gastro-intestinal tract,

* Gutzmann, *Ann. des Mal. de l'Oreille*, xxxiii., Jan., 1907, p. 56.

for it is very rare to find an elongated uvula primarily responsible for the many troubles frequently ascribed to it. If decidedly relaxed, it should be painted regularly with astringent paints of glycerin with tannic acid or iron, or with nitrate of silver, and lozenges of krameria might be ordered. Vocal defects may be met by gargling, humming and various vocal exercises, for the weakness frequently lies more in the soft palate than in the uvula.

When all other sources of symptoms have been excluded,



Fig. 194.—Papillomata of the uvula.

The weight of the growth has dragged down the mucous membrane of the uvula, forming a translucent pedicle.

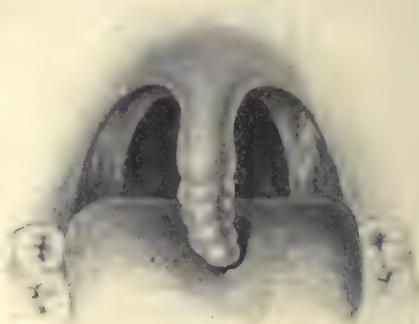


Fig. 195.—Hypertrophy of the uvula.

part of the uvula may be removed. But it cannot be too forcibly insisted on that this is seldom necessary, and that it is now one of the rarest operations in laryngology.

Uvulotomy.—After the application of cocaine and adrenalin (p. 75), and under good illumination, the tip of the uvula is seized with forceps and gently held forwards, while the redundant extremity (about a quarter to one-third of the whole length) is removed with one cut of a pair of blunt-pointed, angular scissors. These should well overlap the uvula, otherwise it may remain attached by its posterior mucous surface. In this way the cut surface is oblique and directed posteriorly, so that it is not irritated by the passage of food. The uvula must not be dragged forcibly forward, or the mucous covering might then be pulled down, and when the proximal part retracted the muscular stump would be exposed, causing slow and painful healing. The whole uvula should never be removed.

After-treatment consists in ordering cold, soft food for twenty-four hours, forbidding alcohol, tobacco, and condiments, and prescribing a carbohc lozenge (Formula 44). This is generally a sufficient anæsthetic; if not, a cocaine or morphia lozenge may be ordered. A soothing spray (Formula 32) can be used for a few days. If there is pain, ice can be sucked; and if there is much reaction or mucus, the pharynx should be syringed (p. 60) with warm alkaline lotion (Formula 29).

CHRONIC HYPERPLASIA OF THE PHARYNX, NASOPHARYNX, AND LARYNX

Synonyms.—*Sclerotic hyperplasia of the throat; chronic œdema of the throat.*

This is a chronic infiltration, of uncertain nature, which is rarely met with, and has not yet been classified. Readers are referred to a very full study of the subject by Brown Kelly.* Three similar cases have been brought before the Laryngological Society of London by Semon,† and one by Dundas Grant.‡

The uvula and adjacent parts of the soft palate, the nasopharynx, the epiglottis, the ary-epiglottic folds, and the arytenoids are slowly affected with a considerable smooth, semi-solid infiltration. The parts assume a yellow colour, suggestive of the appearance of a lardaceous kidney. The condition apparently varies somewhat from day to day.

The causes and pathology are alike obscure. The condition is neither an œdema nor a sclerosis. There are no microscopic evidences of amyloid disease.

One case is known to have quite recovered. Cases have been kept under observation, with very little change in appearances, for ten and fourteen years, neither ulceration nor cicatrization taking place.§ Treatment must be symptomatic.

* A. Brown Kelly, *Lancet*, April 6, 1901, p. 995.

† *Proc. Laryngol. Soc., London*, 1902, No. 7, p. 11.

Rev. Heb. de Laryngol., xxvi., 1905, No. 8, p. 209.

‡ *Proc. Laryngol. Soc., London*, Feb. 6, 1903, p. 76.

§ A. Logan Turner, *Journ. of Laryngol.*, xxix., Feb., 1914, No. 2, p. 57.

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F. Semon, *Lancet*, 1905, i., p. 484.

In addition to the literature quoted by Brown Kelly some references will be found in an article by W. Courvoisier *Munch. med. Woch.*, Juli 29, 1902.

CHAPTER XXII

DISEASES OF THE PALATINE TONSILS

Embryology and anatomy.*—The tonsil is developed in the second cleft recess during the fourth month of foetal life. The faucial pillars represent portions of the 2nd and 3rd branchial arches. The hypoblastic recess opens into the pharynx as a funnel-shaped cavity, and terminates under cover of the soft palate as a narrow channel, which persists as the supratonsillar fossa. On the outer wall of this hypoblastic tube the tonsil is developed. The outlet of the tube is narrowed by two triangular folds of mucous membrane. One of these stretches across the angle formed by the junction of the pillars with the soft palate; this is known as the plica semilunaris. A second fold stretches backwards from the anterior pillar of the fauces, blending with the surface of the tonsil as it passes downwards, but with a free crescentic margin directed inwards and backwards; this is called the plica triangularis.†

This supratonsillar fossa exists in a large proportion of persistent tonsils, and may form a resting-place for foreign bodies or concretions. It is also a convenient cul-de-sac within which micro-organisms may become enclosed by tonsillar inflammation, leading to local or more generalized infection. It is certainly the site of the majority of quinsies (p. 367), and it is possibly one port of entry for tubercle bacilli.‡ It is unfortunate that this fossa should be called supratonsillar, for it lies within the capsule of the tonsil, surrounded by lymphoid tissue, and is never extratonsillar.§ A better name would be "the tonsillar recess."

* For the Histology and Functions of the Tonsils, cf. pp. 8-11.

† G. Seccombe Hett, *Lancet*, Feb. 13, 1909, p. 457.

T. E. Carmody, "Histo-Pathology of the Faucial Tonsil," *Laryngoscope*, xxiv., June, 1914, No. 6, p. 587.

‡ D. R. Paterson, "The Supratonsillar Fossa as the Starting-Point of Infection," *Laryngoscope*, v., 1899, p. 15.

D. R. Paterson, "The Significance of the Tonsils and the Supratonsillar Fossa," *Journ. of Laryngol.*, xxviii., 1913, No. 9, p. 453.

§ J. Hardie Neil, "Surgical Anatomy of the Tonsil," *Brit. Med. Journ.*, Oct. 16, 1909, p. 1139.

G. Seccombe Hett and H. G. Butterfield, "The Anatomy of the Palatine Tonsils," *Journ. of Anat. and Physiol.*, vol. xlv.

G. Hudson-Makuen, "Anatomy of the so-called Capsule of the Faucial Tonsil," *Trans. Amer. Laryngol. Assoc.*, 1915.

Harry A. Barnes, "The Tonsils: Faucial, Lingual, and Pharyngeal." London, 1914.

The tonsil is lodged in the tonsillar fossa. This triangular space lies between the anterior faucial pillar (containing the palatoglossus muscle) and the posterior pillar (containing the palatopharyngeus muscle). The floor or outer wall of the fossa is formed by the superior constrictor of the pharynx. To this the tonsil is attached by comparatively loose areolar tissue, which permits of considerable mobility of the tonsil. On this, the outer or deep, side of the tonsil is the smooth, dense, and closely adherent fibrous capsule (Fig. 202, p. 391).*

CARTILAGE AND BONE IN THE TONSIL

The styloid process may be so elongated that it penetrates the tonsil, and is encountered during a tonsillotomy. I have removed a tonsil with half an inch of the styloid tip in it.

The condition results from ossification extending down the stylo-hyoid ligament. It produces no symptoms, but might cause surprise in those not prepared to encounter it. It may be discovered by the patient, but as a rule is quite latent until the surgeon comes across it accidentally during a digital examination, or when removing a tonsil. Bone forceps may be required, in such cases, to complete a tonsillotomy.

Besides this elongated styloid process, scattered deposits of cartilage and bone are occasionally found when making microscopic sections of amputated tonsils. They may be large enough to be detected by the eye.† These deposits have been regarded as vestigial remains of the second branchial arch; or as a metaplasia of fibrous tissue, and analogous to the cartilage and bone frequently found in the connective-tissue framework of such glands as the parotid, the mammary gland, and the testis.

Muscular fibres, belonging to that group called "musculi tonsillares," are sometimes seen in the connective-tissue capsule of the organ, when examining microscope sections of the tonsil.

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W. Wingrave, *Lancet*, 1898, p. 750.

James E. Newcomb, *Amer. Laryngol. Assoc.*, 26th Congress, 1904, p. 75; and

Med. News, Sept. 24, 1905.

Zuckerkindl, *Arch. Internat. de Laryngol.*, xvii., 1904, No. 3, p. 1014.

W. W. Carter, *Med. Record*, Feb. 4, 1905.

CALCULUS OF THE TONSILS AND PHARYNX

Synonyms.—*Tonsillar calculi; tonsilloliths; calcareous concretions in the tonsils.*

* G. Seccombe Hett, "The Anatomy of the Capsule and the Tonsil," *Journ. of Laryngol.*, xxv., 1910, No. 11, p. 561.

† Walsham, *Lancet*, 1898, p. 394.

These chalky concretions vary in size from small grains, like sand, up to masses as big as a pigeon's egg and weighing an ounce.* They originate in the crypts of the tonsils around filaments of the *Leptothrix buccalis*, and are made up of mucus, pus, epithelial cells, and phosphate and carbonate of lime and magnesia. There may be several calculi in the pocket which they make for themselves; the larger calculi are generally single. In consistence they may be soft and friable, or as hard as stone. When buried below the mucosa their surface is rough and granular. If a portion projects it may become smooth and polished.

Calculi are generally met with in the tonsils, and chiefly in the upper-anterior segment. Here they are apt to ulcerate through to the surface, and become lodged in the supratonsillar fossa, or in a ledge formed by adhesion of the tonsil and the anterior faucial pillar. From the supratonsillar fossa they may gain the soft palate. Smaller concretions may occur in the islands of lymphatic tissue on the posterior pharyngeal walls.

Symptoms.—Frequently there are no symptoms, and the calculus is discovered by accident. In other cases it may cause discomfort, aching in the throat, or pains shooting up to the ear, with recurrent attacks of tonsillitis. Or the concretion may give rise to suppuration and make its way to the surface, or set up a chronic abscess (Fig. 197, p. 378).

The **diagnosis** is determined by the use of a probe or by digital examination.

Treatment.—These concretions can be cleared out, under cocaine, with a curette, or the small scoop which is generally found at one end of a grooved director. Larger ones may require incision, and enucleation with the finger. If the tonsil shows chronic lacunar tonsillitis, it will be best to remove tonsil and calculus together by a complete enucleation (p. 387).

* Robertson, *Brit. Med. Journ.*, 1899, i. p. 14.

CHAPTER XXIII

ACUTE TONSILLITIS

Synonyms.—*Palatine amygdalitis* ; *phlegmon of the tonsils* ; *angina tonsillaris* ; *acute follicular tonsillitis* ; *acute lacunar tonsillitis*.

The mucous membrane of the palatine tonsils may share in any of the inflammatory affections which attack the pharynx. They are commonly inflamed in association with the lingual and pharyngeal tonsils (Waldeyer's ring) in infectious catarrhs of the upper air-tract. The non-specific inflammations of the tonsils have been classified as follows :—

1. Catarrhal tonsillitis, or superficial tonsillar angina.
2. Lacunar tonsillitis (also called croupous, follicular, or cryptic tonsillitis).
3. Parenchymatous tonsillitis.
4. Suppurative tonsillitis

{	Tonsillar	{	<i>a.</i> Anterior.
	Peritonsillar		<i>b.</i> Posterior.
	(or "Quinsy")		<i>c.</i> External.

As the first three affections differ chiefly according to the degree and extent of the inflammation, and as they often shade into one another, we shall consider them in one chapter.

Etiology.—The causes are (1) predisposing, (2) exciting.

1. Predisposing causes.—Tonsillitis is most frequently met with between the ages of 10 and 30. It sometimes occurs in children, but is rare after 50. The condition of the tonsils forms a potent predisposing factor, as inflammation readily occurs in glands that are enlarged and subject to chronic lacunar tonsillitis, to calcareous deposits, to suppuration in the supratonsillar fossæ, and in those with adhesions of the triangular ligaments and anterior faucial pillars. Incomplete removal of the tonsils, by laying open the crypts, seems in many cases to favour tonsillitis. It occurs as the initial stage of measles and scarlatina, and is frequently present in diphtheria and in secondary syphilis. Water and milk may carry infection.* Sewer gas, overwork in bad air, and mental anxiety are predisposing causes. The disease is undoubtedly more common in certain seasons, being rarest in summer and most frequent in spring and autumn.

* George Newman, *Brit. Med. Journ.*, Aug. 27, 1904, p. 421.

Winslow, Darling, Richardson, and Goodale, *Boston Med. and Surg. Journ.*, clxv., pp. 899-908.

Rheumatism has been regarded as one of the most constant predisposing factors, but it is uncertain whether the so-called rheumatic diathesis simply predisposes the tonsil to infection, or whether the tonsil acts as the port of entry for the rheumatic poison. One or both conditions may occur.* Fletcher Ingals has investigated the subject and come to the conclusion that the relation is only exceptional, and suggests that the rheumatic pains are a phenomenon of septic infection through the tonsil.† More recently it has been urged that the commonest avenue of rheumatic infection is the tonsil.‡ Gout may also be a predisposing affection. Recurring attacks of tonsillitis have been traced to infection by pus coming down through the naso-pharynx from suppuration in the accessory sinuses, and secondary lymphatic infection is no doubt the explanation of the cases which are met with after operations on the nose, even in such trivial instances as those of the use of the galvano-cautery.

Tonsillitis of a non-specific character is not uncommon in convalescence from scarlatina or diphtheria.§ Finally, mechanical causes may give rise to inflammation of the tonsils, as in the impaction of foreign bodies.

2. Exciting cause.—In the majority of cases this is doubtless of microbic nature.|| This is confirmed by the observation that the disease is sometimes infectious, and not infrequently epidemic, chiefly in the foul atmosphere of badly ventilated dormitories or hospital wards. Bacteriology, unfortunately, is not of much assistance in confirming this view, nor in helping to a classification of inflammatory tonsillar diseases, because (a) the mouth in health always contains streptococci, staphylococci, and pneumococci, and (b) it is seldom that only one organism is encountered in any inflammatory disease of the tonsil, examination generally showing a mixed infection.¶

The diplococcus of pneumonia is said to be responsible for 3-7 per cent. of cases of acute tonsillitis,** and to the bacillus of Friedländer is attributed a very rare form of benign, membranous tonsillitis.††

Morbid anatomy.—If the disease is limited to the catarrhal variety, the surface of the tonsils shows the changes common to inflammation on mucous membranes. In the lacunar variety the morbid changes are mainly confined to the crypts, which become filled with epithelial cells, fibrin, leucocytes, and bacteria, these forming an amorphous mass which fills the crypts and appears at their mouths as discrete patches of white, grey, or yellow exudation. In the parenchymatous form there is marked leucocytosis into the lymphatic nodules, and congestion of the whole gland. Small, discrete, intra-

* StClair Thomson, *Practitioner*, "Rheumatism Number," lxvi., Jan., 1901, p. 35.

† *Laryngoscope*, xvii., Sept., 1907, p. 712.

Roos, *Berlin. klin. Woch.*, June 18 and 25, 1894.

‡ W. P. S. Branson, *Brit. Med. Journ.*, 1912, Nov. 23, p. 1429.

§ J. D. Rolleston, *ibid.*, May 19, 1906, p. 1152.

|| B. Fraenkel, "Infectious Nature of Lacunar Tonsillitis," *ibid.*, Oct. 26, 1895 p. 1018.

¶ G. H. Lemoine, "Bactériologie des Angines," *Gaz. des Hôp.*, 25 Juillet, 1896, No. 85.

J. G. Dwyer and Miss Gignoux, "Bacteriological Examination of the Tonsillar Crypts," *Laryngoscope*, xx., 1910, No. 11, p. 1042.

** Darien, Thèse de Lyon, 1902; and *Brit. Med. Journ. Epit.*, July 19, 1902.

†† Nicolle and Hébert, *Presse Méd.*, 31 Mai, 1902.

follicular foci of suppuration occur, chiefly in association with the *Streptococcus pyogenes*.*

Symptoms.—Tonsillitis is not necessarily ushered in with symptoms referable to the throat. Not uncommonly a patient may only complain of malaise, anorexia, thirst, prostration, and some fever. There may be a slight rigor, and the temperature may be raised to anything between 100° F. and 103° F. It is only on examining the pharynx that an explanation of these symptoms is found in a condition of subacute follicular tonsillitis which may have caused no decided local discomfort.

In other cases the local symptoms make themselves felt at once. A patient then complains of headache, backache, pains in the limbs, general malaise, and at the same time has a sense of fullness in the throat, amounting soon to sharp pain which radiates up to the ear, and is greatly augmented on attempting to swallow. This dysphagia accounts for a great deal of the anorexia which is said to accompany the acute form of the disease.

As the isthmus of the fauces gets encroached upon, and the movement of the soft palate impeded, the voice becomes thick and muffled. When the patient drops into a fitful sleep he snores loudly. The senses of smell and taste are suspended. Not infrequently there is some deafness from Eustachian catarrh, but the spread of active inflammation to the middle ear is not common. The glands at the angle of the lower jaw are swollen and in most cases very tender, so that the head is held stiffly. Both tonsils are commonly affected. The temperature varies according to the severity and extent and period of the attack, but it is always raised, varying from 100° F. (37·8° C.) to 105° F. (40·5° C.). Often there are morning remissions, which must not be looked on too favourably in the absence of any rebate in the local symptoms. The pulse is from 100 to 120, and is generally full and bounding.

Examination.—The breath is often particularly fetid, the tongue is coated and in acute cases is protruded with difficulty. It is not easy in some instances to obtain a good view of the pharynx, and inspection is much facilitated by employing the light reflected from a frontal mirror. In the milder forms the tonsils are seen to be larger than usual, and of a more or less marked livid red hue. This inflammatory blush extends on to the anterior faucial pillars, the uvula, soft palate, and pharynx, where the evidence of pharyngitis is apparent. The congested surface of the tonsil is dotted over with irregular islets of inspissated debris, which occlude

* Goodale, *Trans. Amer. Laryngol. Assoc.*, 1899, p. 43.

the orifices of the crypts (Plate XIII., Fig. 2, facing p. 358). This material at first lies somewhat below the surface of the tonsil, and, being limited to the crypt, occurs in discrete masses which can be wiped away, but tend to form again. A similar condition is often revealed by the mirror at the base of the tongue, and the pharyngeal tonsil will be seen to be swollen, darkly congested, and possibly showing the same follicular inflammation. In certain cases the collection is not limited to the mouths of the crypts, but extends over the intervening surface of the tonsil in the form of a false membrane, and, more rarely, on to the soft palate and uvula. This false membrane is white, greyish, or dirty yellow in colour, is readily separated, and leaves an abraded but not bleeding surface underneath.

Both tonsils will generally be found to present similar changes, but in different degrees; and in one the process may be retrograding, while in the other it is beginning.

When the parenchyma of the gland is more involved the local symptoms of distress are all more marked. The tonsils may be in contact in the middle line. The great swelling of the tonsil distends the anterior faucial pillar, pushes upwards the soft palate, and encroaches on the uvula, which is often swollen with an œdema-like infiltration to the form of an inverted club. The obstruction to the circulation in this region leads to an œdema in the more relaxed tissue on the posterior wall of the soft palate, which may then be seen hanging down in a translucent bag on each side of the uvula.

The whole region is festooned with loops of thick, tenacious mucus which the patient is only able to clear away with painful difficulty. The palate is so impeded in its action that the voice becomes almost unintelligible, and the attempt to swallow liquids may be followed by regurgitation through the nostrils. When suppuration takes place in the tonsil itself—a rare occurrence—an abscess is formed in one or more of the lymph nodules, and appears to make its way to the surface by molecular necrosis of the intervening tissue. It then discharges its purulent contents into the pharynx without marked reaction. With the evolution of these symptoms the patient's face assumes a look of pale, wasted, careworn anxiety, and he is apt to be extremely nervous and despondent owing to the loss of sleep and food, the continuous pain, and the constant efforts at painful deglutition. There is always more or less pharyngitis. In addition to the constipation, which is a very frequent part of the disease, the urine is scanty, high-coloured, and charged with urates. It seldom contains any albumin, and, when it does, it is apt to appear as a late phenomenon, and therefore as

a complication of the disease. This is a distinguishing point from diphtheria (p. 722). It is said that the spleen is often enlarged.*

In the milder forms of catarrhal and lacunar tonsillitis the process may only last three or four days, but it is apt to go on increasing till about the fifth day, declining at the seventh with an abatement of the general symptoms, but leaving some slight dysphagia for some time.

Diagnosis.—This generally presents no difficulty. It is usual to lay stress on the points which distinguish follicular tonsillitis from diphtheria. The latter disease is more gradual in its onset, and is more apt to be limited to one side, or, at least, does not start on one side and then develop on the other as is generally the case in tonsillitis. There is less pain and fever with diphtheria; the urine is much more frequently albuminous in an early stage of the disease; the mouth is opened more easily, and the characteristic adherent, spreading false membrane is then seen; although generally more marked on the tonsils, this membrane is seldom limited to the tonsillar surface, but generally invades the soft palate and uvula. This spread of the membrane in lacunar tonsillitis is uncommon, and in no case does it—as it is so apt to do in diphtheria—spread to the larynx, postnasal space, or nose. Still, it is well to remember that the membrane of tonsillitis is not always detachable or discrete, nor limited to the tonsils. In both affections the glands are enlarged. The younger the child the more likely is diphtheria to be met with.

Finally, a culture of a small portion of membrane, or of a swab from the surface, will show the absence of the Klebs-Löffler bacillus (see Table of Comparative Diagnosis on p. 726).

An early diagnosis of the tonsillitis of scarlatina is always of the highest importance. The characteristic feature is that both tonsils are attacked simultaneously and equally; the patient is usually under the customary age for tonsillitis; the pyrexia is more marked, and not only is the face flushed, but the skin feels particularly hot and dry to the touch, while the pulse is disproportionately rapid. The papillæ of the tongue are early enlarged, showing the typical “strawberry appearance,” and development of the rash is characteristic. Simple tonsillitis, however, is occasionally accompanied by a slight rash. “The strictly scarlatinal factor in the throat of scarlet fever is a vivid red injection of the whole of the fauces, palate, and buccal mucous membrane.” “This diffuse redness of the palate and buccal surface, though apparent at the commencement of the attack in the large majority of cases, fades rapidly, and in mild attacks by the end of twenty-four or

* Allbutt and Rolleston's “System of Medicine,” iv., p. 164. London, 1908.

forty-eight hours may be only apparent on the tonsils and along the free border of the velum and uvula, which then come to present a relatively deep red and tumid appearance."* In scarlatina the glands are markedly involved, and often break down and suppurate, while symptoms of septicæmia may complicate the disease. The Eustachian tube and middle ear are frequently involved. These symptoms appear to be due to a virulent streptococcus infection.

Even hydrophobia has been mistaken at its outset for tonsillitis.† The possibility of confusing tonsillitis with syphilis, malignant disease, or glosso-labio-laryngeal paralysis is very remote when it is remembered that they are not associated with increase of pulse or temperature, and are chronic affections which frequently give a history of weeks or months, instead of one of days, before they come under observation.

Prognosis.—In uncomplicated cases this is always favourable. The disease generally runs its course in a week, but may drag out to two or three weeks. It does not spread to the larynx. A peritonsillar abscess, or quinsy, may occur, greatly to increase the discomfort of the sufferer, and in many cases of quinsy there is some lacunar tonsillitis. Prognosis must be guarded if there is any suspicion that a tonsillitis is an early manifestation of the septic sore throat which is due to a more virulent infection, producing septicæmia, phlegmonous pharyngitis, or angina Ludovici (p. 443).

Treatment.—The treatment of tonsillitis is based on the recognition that there is a general infection. Local treatment must therefore be limited to such soothing and cleansing measures as will promote the natural evolution of the disease. It is questionable if any topical applications can abort it. Antiseptics cannot be used in sufficient strength to be effective, and, if they could, the virus has most probably passed beyond their reach before the disease declares itself.

The patient should be isolated, and inquiries instituted as to any source of infection in the house, either in the shape of other throat cases, or of escape of sewer or coal gas. In most cases the treatment is initiated by a brisk mercurial purge. As there is often difficulty in swallowing pills or bulky powders, 2 to 4 grains of calomel with 3 grains of bicarbonate of soda can be placed on the tongue and washed down with a sip of milk. There is nothing better to follow this, in about eight hours, than a dose of the old

* F. Foord Caiger, *Clinical Journ.*, Dec. 31, 1902.

† Morell Mackenzie, "Diseases of the Throat and Nose," vol. i., p. 56. London, 1880.

black draught, mist. sennæ co., though it can be replaced by 1 to 2 ounces of decoct. aloes co., the ordinary mistura alba of hospitals, or a few teaspoonfuls of Rochelle salts.

Many practitioners are of opinion that they can abort an attack by the early administration of small and repeated doses of tincture of aconite. Others pin their faith to quinine. My own custom is to rely on salicylic acid, or on one of its derivatives. The salicylate of soda can be given in doses of 10 to 15 grains, administered with decreasing frequency, i.e. repeated in one hour, then in two hours, and afterwards every three hours or as required. If there is much headache, or neuralgic pain, 3 to 5 grains of antipyrin can be added to each dose (Formula 48, p. 802). Salol in doses of 5 grains can be administered alone or in combination with phenacetin. In cases where the salicylates are contra-indicated, aspirin or salol can be ordered, either alone or in combination with phenacetin; or benzoate of soda in 10-grain doses might be ordered. Guaiacum formerly enjoyed much repute in the treatment of this disease, the mistura guaiaci being administered internally, while guaiacum lozenges were given to suck. In the epidemic form, due to drinking milk from cows affected with suppurative mammitis, marked improvement appeared to follow the use of antistreptococcus serum.*

Where the disease is so acute that the patient can hardly swallow or open his mouth, he should not be asked to do more than cleanse it occasionally with some alkaline lotion. Where the disease is of a milder character the tonsils and fauces should be sprayed, or, still better, syringed with a lotion of salicylic acid, chlorate of potash, permanganate of potash, sanitas, listerine, or other mild antiseptic (Formulæ 8 to 12 and 28 to 30). If there is much mucus about, or if the mouths of the crypts are crowded with secretion, an alkaline lotion should be used first. In all cases the lotions should be used as warm as they can comfortably be borne. Syringing the pharynx is more effective because a large amount of fluid can be employed, and in a warmer state. The mere impact on the tonsils not only cleanses them more thoroughly, but appears to reduce congestion.

Cocaine should be avoided, as it gives rise to a disagreeable paræsthesia, and the patient feels his throat more swollen and blocked up than before. In the rare cases where the patient appears faint from want of food a 2 per cent. solution might be sprayed shortly before a meal, but it would be wiser to try first to obtain the same result by the insufflation of orthoform.

Those who favour pigments claim to have good results from

* R. French, *Brit. Med. Journ.*, April 9, 1904.

painting the tonsils with 1 per cent. carbolic in glycerin, or 5 per cent. menthol and guaiacol in almond oil. In milder cases the local symptoms may be relieved by occasional painting with argyrol (25 per cent.). Antiseptic lozenges are helpful (Formulæ 43 and 46). In small or fractious children the following should be given, undiluted :—

R. Tinct. ferri chloridi	5ii
Glycerini ad	3ii
5ss every hour.	

It is not disagreeable, and acts locally while we get the systemic effect at the same time.

It is doubtful if the external application of any medicament is of the slightest value, but warmth and support are undoubtedly comforting, and a patient generally prefers to have a warm fomentation, or a good mass of cotton-wool applied to the angle of the jaw and firmly secured by a silk handkerchief passing upwards over the vertex—not tied round the neck. This is more grateful than an ice-bag or a Leiter's coil.

Scarification of the tonsils is as useless as it is unscientific.

The patient must be given such nourishment as he can manage. He will often find it easier to swallow some semi-solid food—custard pudding, beef-tea well thickened with arrowroot, chicken purée, compôte of fruit, etc.—than liquids. Some pain in swallowing the latter will be spared him if he sucks them through a straw, and in this way he should be allowed to drink freely of lemonade, and of lemon squash in which the whites of eggs have been beaten up. These drinks are less cloying than milk, and leave a clearer sensation in the throat. Hovell suggests a method of diminishing the dysphagia. A nurse stands behind the head of the patient, and firmly applies the palms of the hands over the ears, and then behind the angles of the jaws. If she makes strong pressure at the moment that the bolus of food enters the pharynx the pain of its transit to the œsophagus will be considerably decreased.

As the disease diminishes, the treatment by salicylates should not be suddenly abandoned, particularly if there is any suspicion of its rheumatic nature. In the anæmic state which is often left, a most useful drug is the salicylate of iron (Formula 59, p. 810). Change of air and rest, with nourishing diet, and such tonics as iron, quinine, strychnine, or arsenic, will frequently be called for during convalescence. In children the compound syrup of the phosphates of iron, the syrup ferri iodidi, or the fresh saccharated carbonate of iron may be given.

Prevention.—In all cases a careful examination should be made to detect the cause of the disease, and, if possible, remove it. Any suspected sources of contagion should be avoided; special precautions and advice may be required if the rheumatic nature of the attack is manifest; and particular care should be given to the condition of the mouth, pharynx, and nose. The teeth and gums must be rendered as sound and healthy as possible. Nasal respiration, if impeded, must be corrected, and any disease or hypertrophy of Waldeyer's ring must receive attention. If the attacks of tonsillitis are frequent, and if the tonsils or their stumps are unhealthy, complete enucleation is the one and only surgical measure indicated. (*See Enucleation of the Tonsil*, p. 387.)

Complications.—Throughout an attack of tonsillitis, however benign it may be, and for some time after its subsidence, the physician should be on his guard in respect to possible developments or complications. Reference has already been made to the possible supervention, particularly in children, of specific infectious disorders. At all ages, and in all stages, a watch should be kept for the evolution of any joint or cardiac lesions. The urine must be examined in case any albuminuria develops. Any weakness of the palate, any local paralysis, marked anæmia, or cardiac failure would indicate that, after all, the case had been one of diphtheritic infection, for the membrane may have been so slight and evanescent, or so hidden on the back of the soft palate, that it escaped detection. Pain in the ear, other than that caused by swallowing, should require a careful inspection of the drum. Thrombosis of the cavernous sinus has been recorded as a sequela of tonsillitis,* although it is quite possible that this complication may have arisen from a coincident infection of the sphenoidal sinus (*see* p. 253).

Appendicitis has followed acute pharyngitis,† sometimes a week after a streptococcal tonsillitis with albuminuria had disappeared.‡ Erythema (exudativa or nodosum), purpura, and erysipelas have been observed. Orchitis, oöphoritis, pleuropneumonia, paralysis, acute osteo-myelitis, pyæmia, and septic manifestations have been described.§ Angina pectoris, lasting several weeks, has been recorded as a sequela of tonsillitis, and has been attributed to a toxic neuralgia of the cardiac plexus (Zilgien).|| Endocarditis may occur. Two explanations of this are put forward: one is that the affection of the cardiac valves and the acute inflammation of the tonsils are both manifestations

* H. J. Davis, *Proc. Roy. Soc. Med.*, Laryngol. Section, vi., June 6, 1913, p. 174.

† Kelynack, "Pathology of the Vermiform Appendix," p. 98. London, 1893.

‡ H. Weber, *Münch. med. Woch.*, Dec. 30, 1902. (Gives a full bibliography.)

§ Rochemont, *ibid.*, March 7, 1899.

|| *Deutsch. med. Zeit.*, March 17, 1898; and in *Rev. Méd. de l'Est*, 15 Oct., 1897.

of rheumatism. The other is that the endocarditis arises directly from septic infection through the tonsils, independently of acute rheumatism, various micro-organisms having first found their way into the tissues of the tonsils, whence they or their products pass with the blood-stream or through the lymph channels to the joints and the heart, where they set up characteristic manifestations.*

* Buss, *Deutsch. Arch. f. klin. Med.*, Bd. liv., 1894.

Packard, *Amer. Journ. Med. Sci.*, Jan., 1900.

Osler, "A System of Medicine," vol. iv. London, 1908.

CHAPTER XXIV

CHRONIC ENLARGEMENT OF THE TONSILS, INCLUDING CHRONIC FOLLICULAR TONSILLITIS

Synonyms.—*Hypertrophic tonsillitis; hyperplastic tonsillitis; chronic lacunar (or follicular) tonsillitis; chronic parenchymatous hyperplasia; chronic fibroid degeneration of the tonsils.*

In children there are always lymphoid glands between the pillars of the fauces. They are not necessarily pathological because they project somewhat. They are present from infancy, and tend to atrophy towards puberty; they are rare in adults, but sometimes persist throughout life. Many enlargements of the tonsils are purely inflammatory; others are hyperplastic and temporary, and not true hypertrophies. In some cases the hypertrophy appears to develop only towards puberty.

Secombe Hett has classified palatine tonsils according to the following clinical types, namely: (1) the embedded tonsil (Fig. 196); (2) the projecting tonsil (Fig. 222, p. 452); (3) the flat tonsil (Fig. 197, p. 378); (4) the hanging tonsil (Fig. 199); (5) tonsils with preponderance of anterior, middle, or posterior masses, or of a combination of these (Plate XIII., Fig. 2, p. 358); and (6) the tonsil with marked lingual prolongation.*

Etiology.—The precise causes of lymphoid hypertrophy are unknown. Formerly it was attributed to the "strumous" diathesis. The tendency to it appears to be hereditary, and enlarged tonsils "run in families." Sex seems to have no influence, although in one family boys will be more affected, and in another girls. They have been attributed to mouth-breathing, so often are they met with in association with adenoids; but although they are doubtless aggravated by mouth-breathing, it is probable that the same causes are responsible for the lymphoid overgrowth in both the pharynx and the naso-pharynx. They are frequently a legacy of scarlatina, measles, diphtheria, whooping-cough, influenza, and smallpox, or repeated attacks of tonsillitis. As a rule they begin to enlarge about the age of 3 or 4, and hypertrophy does not commence after puberty.

Their frequency in school children varies from 33·4 per cent.† to

* *Journ. of Anat. and Physiol.*, vol. xliv.

† Leslie Thorne Thorne, *Brit. Med. Journ.*, April 9, 1904.

39.48 per cent.* In children there is always some accompanying adenoid overgrowth in the naso-pharynx, but in adults hypertrophic palatine tonsils are frequently found alone.

Pathology.—There is an increase of the normal structures of the tonsil, the proportional increase varying somewhat in different stages and ages. Three principal varieties may be considered: (1) the chronic lacunar type, in which the crypts are more marked, and contain a variable amount of mucus and altered epithelium undergoing fatty degeneration; (2) chronic parenchymatous hyperplasia, in which the tonsil is soft and friable, from overgrowth of lymphoid tissue; and (3) chronic fibroid degeneration, in which the most marked increase is in the connective-tissue stroma, the elements of which, by com-

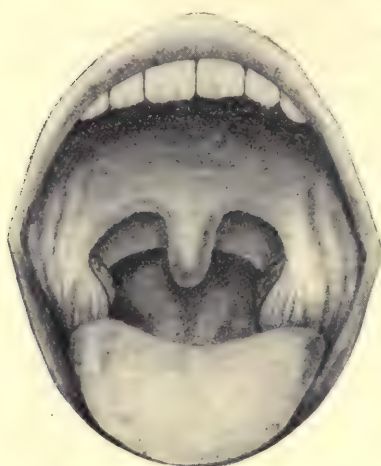


Fig. 196.—Buried tonsils, with adherent plica triangularis.

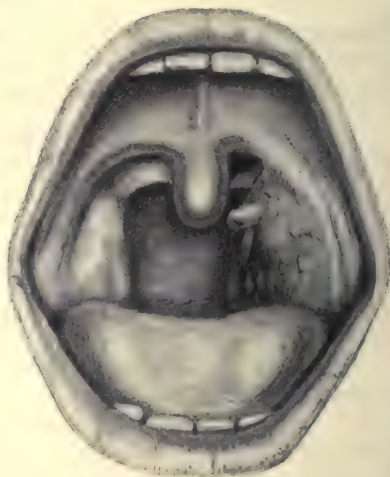


Fig. 197.—Chronic abscess of the left tonsil.

Shows a pouting granulation, and pus trickling down the front of the tonsil.

pression, tend to cause atrophy of lymph-nodules and vessels, and obstruction or obliteration of the mouths of the crypts. Occlusion of these latter may take place, leading to cystic formation or the deposit of calcareous masses.

In some instances, probably as a result of repeated attacks of inflammation, the tonsil may be firmly adherent, entirely or in part, to one or both pillars of the fauces. In the pouches above, or between these adhesions, we are very apt to find cheesy collections. The crypts in a tonsil vary from 20 to 30 in number.† A larger lacuna is often only the estuary of several crypts. This common opening is sometimes bridged across by a bridle of tissue. When neighbouring crypts are distended by a caseous magma they may communicate, forming a chronic abscess (Fig. 197).

* William Robertson, *Brit. Med. Journ.*, Feb. 23, 1907.

† A. Courtade, *Arch. Internat. de Laryngol.*, xvi., 1903.

Symptoms.—The effects of enlarged tonsils are so well known that it will be sufficient to refer to them briefly. The tone of the voice is frequently thick and woolly, with a “tonsillar” ring about it which can be distinguished from that caused by nasal or laryngeal obstruction. Articulation is apt to be indistinct. The enlargement of tonsils usually takes place so gradually that, unless inflamed, patients are seldom conscious of their presence, although some may complain of the sensation as of a foreign body. Eustachian catarrh may be kept up by the interference with the action of the levator palati and salpingo-pharyngeus muscles. The presence of unhealthy tonsils appears to lead to changes in the teeth, while the reverse also holds good. The cervical glands are apt to be chronically enlarged. Of 64 consecutive cases of children suffering from tuberculous disease of the upper cervical glands, 24 showed histological evidence of tuberculosis of the tonsils.* Indigestion is frequent, and gastric irritation is shown by the retching so easily produced when the throat is examined or simply opened for inspection.

Chronic or recurrent lacunar tonsillitis is frequent, and peritonsillitis may be associated with a small amount of tonsillar hypertrophy. The patient sometimes complains of foul breath, or the taste of “rotten stuff” in the mouth, or of being able to spit out masses of evil-tasting cheesy matter. The absorption of this material leads to systemic effects in the way of general ill-health—anæmia, languor, and general feebleness, occasional rises of temperature, or attacks of “glandular fever.”

Cough is sometimes attributable to the presence of the tonsils, and various reflex symptoms have occasionally been traced to them. Enlarged tonsils are so frequently associated with naso-pharyngeal adenoids that it is sometimes difficult to say how many of the symptoms—mouth-breathing, snoring, shortness of breath, etc.—which formerly were generally attributed to the palatine tonsils are not principally caused by the naso-pharyngeal growth. Certain it is that the removal of the former glands mitigates the symptoms, whereas they more completely disappear when the adenoids are cleared away, although the faucial tonsils may remain.

In adults enlarged tonsils are apt to produce a degree of respiratory obstruction and venous stasis, conducive to varicose veins, emphysema, and hernia, and sometimes revealed by asphyxial symptoms when under ether.† This is one reason why chloroform by the “open method” is more suitable in tonsil cases.

* A. Philip Mitchell, *Lancet*, Dec. 6, 1913, p. 1620.

† H. Bellamy Gardner, *ibid.*, Sept. 30, 1905.

We occasionally find children with enlarged tonsils who, at the moment of examination, apparently enjoy good health.

Examination.—The enlargement is generally more or less symmetrical. If one tonsil only is hypertrophied it should attract particular attention, unless there is a history of the other having been amputated. Sometimes they are so large as to be touching in the middle line, almost filling the throat, and interfering with the movement of the palate. If the tongue is not well depressed and held forward, the full extent of the gland may escape detection

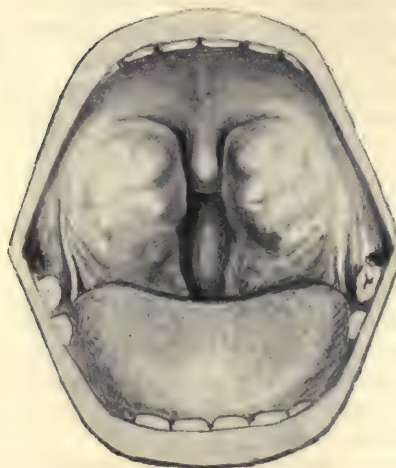


Fig. 198.—Hypertrophied tonsils, to show how the lower, pendulous portion may escape detection with ordinary inspection. (*See next figure.*)

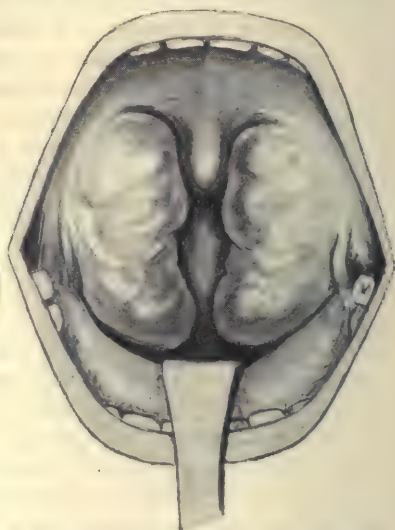


Fig. 199.—Enlarged pedunculated tonsils.

Shows the lower, pendulous portion of pedunculated tonsils, which only comes into view on using a tongue-depressor.

(Fig. 199). The prominent tonsil is often distinctly pedunculated. The mouths of the crypts may be occupied by dirty white or yellow cheesy matter. If not apparent, this can be extruded by pressing against the root of the tonsil with the end of the spatula. In this way mortar-like masses or even calculi can be brought to the surface. In some cases these collections do not occupy the crypts, but are lodged in the supratonsillar fossa, or in spaces formed by bands of adhesion between the tonsil and the anterior faucial pillar. Some patients have taught themselves to evacuate these masses daily, by hooking forward the anterior pillar with the little finger of one hand while they press on the gland from the out-

side with the other. These cheesy masses are occasionally very fetid.

In the form of chronic parenchymatous enlargement the tonsils are not so prominent. They are frequently large and flat, being "submerged" or buried between the faucial pillars, to which they are often fixed like a diamond in its setting (*le tonsil enchatonné*). On seizing the gland with a vulsellum or tenaculum and drawing it towards the middle line, these adhesions are demonstrated, while the gland is seen to be larger than might have been anticipated.

Retention cysts often escape notice, unless close to the surface, when their yellow contents may be seen through the thinned-out covering.

Diagnosis.—This rarely presents any difficulty. But unilateral enlargement should always be looked upon with suspicion, especially in an adult, as malignant disease, and particularly lympho-sarcoma, may develop so insidiously as to be mistaken for a simple enlargement. I have even known sarcoma to develop simultaneously and almost symmetrically in both tonsils in a young woman of 19. Palpation with the finger is valuable in all suspicious cases, as it will reveal a peculiar hardness in malignant disease (cf. p. 454).

Prognosis.—Some enlarged tonsils are only discovered by accident in adults, and may remain throughout life, with no very apparent ill effects. These cases are exceptional. In most instances they induce symptoms which call for their removal, while in all children their presence increases the risk of contracting tubercle, diphtheria, scarlatina, and other contagious disorders. They tend to disappear at puberty, but considerable risks are incurred while awaiting this uncertain involution. If found after puberty there is no hope of their complete spontaneous disappearance.

Treatment.—Chronic lacunar tonsillitis is best treated by the local cleansing measures described as suitable for acute tonsillitis on p. 372. Gargling or syringing with alkaline and antiseptic lotions is followed by painting the tonsils with iodine, resorcin, menthol, or carbolic (Formula 72). The same local treatment is suitable for simple parenchymatous enlargement, in which occasional applications of argyrol (25 per cent.) or nitrate of silver (2-5 per cent.) may be made. A certain number of these cases may be benefited by galvano-cautery puncture, particularly if there is any objection to more radical measures (*see* p. 383). Internally the effect of iodine may be tried, but reliance is generally placed on arsenic, and such preparations of iron as *syrupus ferri iodidi* and Parrish's food, together with maltine, cod-liver oil, and general improvement of the health. Change of air, and in children sea-air, will help in restoring tonsils to their normal condition. The time-honoured applications of such local pigments as glycerin with tannin, perchloride of iron, or carbolic have no

effect in reducing an established hypertrophy. They may bring about a more healthy condition of the crypts, although this is more likely to be effected with some preparation of iodine (Formula 71). The same may be said for caustics in general, and change of air.

Indications for removal.—The following is an epitome of most of the chief conditions which render complete removal advisable:—

1. Any interference with respiration, night or day.
2. Threatened alteration of voice or articulation.
3. Eustachian catarrh, or the presence of any middle-ear affection.
4. Chronic enlargement of the cervical glands.*
5. Chronic lacunar tonsillitis; or cheesy collections in the supratonsillar fossa or between the tonsil and the pillars.
6. If adenoids are present and are to be operated on, the opportunity of the anæsthetic should be utilized to remove any decided tonsillar hypertrophy.
7. Attacks due to septic absorption through the tonsils, or a chronic condition of ill-health which can be attributed to infection through the tonsillar area.
8. Frequent attacks of tonsillar inflammation, or of peritonsillar abscess.

The possibility of latent tuberculosis, particularly when the cervical glands are enlarged, must also be considered. Of hypertrophied tonsils taken from 90 children who showed no clinical evidence of tuberculous disease, 6·5 per cent. gave histological evidence of tuberculosis, and 10 per cent. yielded positive results on inoculation. When the upper deep cervical glands were tuberculous there was histological evidence of tubercle in 37·5 per cent., and inoculation evidence in 30 per cent., of the removed tonsils.† There are no clinical signs by which tuberculosis of the tonsils can be recognized; indeed, tonsillar tuberculosis, being chronic in type, leads to fibrosis and shrinkage, so that the tonsils are often small, ragged, and atrophic.‡ According to A. P. Mitchell the faucial tonsils are not only the most frequent portals of entry for the tubercle bacillus, but in a large proportion of cases a well-marked tuberculosis of the upper deep cervical glands is secondary to a small tuberculous focus in the tonsil. He considers tuberculous cow's milk as the general source of infection,

* H. Gardiner, "Tonsils and Chronic Cervical Adenitis," *Lancet*, Oct. 2, 1915, p. 752.

† A. Philip Mitchell, *Lancet*, Dec. 6, 1913, p. 1620; and *Brit. Med. Journ.*, Jan. 17, 1914, p. 125.

‡ A. D. Fordyce and E. W. S. Carmichael, *Lancet*, Jan. 3, 1914, p. 23.
Stanley Griffith, *ibid.*, June 19, 1915.

but other observers attribute the majority of cases to tubercle bacilli of the human and not the bovine type. (Cf. p. 614.)

In many cases it is the septic state of the tonsils, rather than their size, which determines the question of removal.

It should be noted that the severity or frequency of tonsillar and peritonsillar inflammation bears no relation to the size of the hypertrophied gland. Some of the largest tonsils give rise to the least local inflammatory trouble. Again, in regard to the removal of tonsils with adenoids, it is sometimes held that if the latter are cleared away the palatine tonsils will atrophy. This may be true of small tonsils in children towards 12 years of age. If not diseased they may then be left. But in younger children, when adenoids only are removed, I have found that the tonsils not only persist but continue to enlarge, and give rise to trouble later.

Objections to removal.—The following objections are still frequently urged:—

1. The tonsils will disappear, the child "growing out of them."
2. Nature must have placed them in the throat for some protective action, with which it would be unwise to interfere.
3. Removal may alter the voice.
4. Removal may cause sterility.
5. Removal may stop growth.
6. The tonsils may grow again.
7. There is a great risk from hæmorrhage.

These objections may be answered as follows:—

1. The tonsils do commence to shrink about the age of 12, and tend to disappear at puberty or soon after. But if unhealthy they may remain, and, even in a shrunken condition, give rise to much local and general ill-health. During the years they are undergoing atrophy their presence exposes the patient to the risk of many evils, sometimes fraught with life-long results.

2. The theories as to the protective action of the tonsils have already been considered (p. 10). Whatever this may be in a normal tonsil, it is evident that a gland which has undergone hypertrophic degeneration, with much of its lymphoid tissue destroyed, and often riddled with septic secretion, is no longer a defence to the organism. On the contrary, it offers a culture-bed for the various organisms to which it is exposed by mouth-breathing, and instead of being a protection the tonsil is converted into a source of possible danger.

3. The objection that the voice may be altered requires more consideration. Lennox Browne* says that, as a rule, "nothing but ultimate good to the voice can follow from this operation in suitable cases"; while Semon and Watson Williams are still more confident that "removal of the tonsils never impairs the voice."† Pearson found in nine amateurs that the singing voice was improved after enucleation of the tonsils by dissection; while a professional singer

* "The Throat and Nose," p. 360. London, 1899.

† Allbutt and Rolleston's "System of Medicine," iv., part 2, p. 173. 1908.

was satisfied that her voice had lost nothing although the pillars were fused on both sides and the palate was asymmetrical.* Dabney holds that a clean tonsillectomy will increase the singing register by two tones.†

On the other hand, Lack holds that, in adults, there is a risk to the voice, and that this possibility is not, generally speaking, sufficiently considered.‡ Réthi gives a special warning against complete removal of the tonsils in singers,§ and Hudson Makuen thinks it safer, in the case of singers, to leave the tonsil capsule|| and possibly some portions of the tonsil in the fauces to keep the pillars of the palate apart.¶ Bryan D. Sheedy examined a series of 100 throats, three to ten months after operation by the modern method of enucleation, and found some deformity in the pharynx in 80 per cent. About 5 per cent. complained of difficulty in using certain words and had nasal intonation six months after operation. Four of the whole number had practically lost their singing voice.**

The speaking voice is undoubtedly improved in all cases, although it may take a little time for the patient to relearn the complete use of the muscles which have been liberated by the removal of the tonsils. In the more delicate matter of the singing voice there is certainly a risk that the patient may not succeed in acquiring the instinctive control of these muscles so completely as to give him the peculiar "tone" which he may previously have prized. Patients who are only commencing the study of singing can safely be advised to have the tonsils removed, if such a step is indicated; but those who already possess a trained voice must be told of the possible risk, and that they will require renewed study and practice, although they will certainly in the end acquire a stronger and better voice, if not one of precisely the same tone.

4. The suggestion that removal of the tonsils can cause sterility has no foundation in fact, and is seldom heard of nowadays.

5. The idea that tonsillectomy can arrest growth is equally baseless. It possibly originated in former times, when tonsils only were removed but the unrecognized adenoids were left untouched. In such cases the children doubtless remained ill developed, and the operation on the tonsils was blamed for this defect.

6. When not completely enucleated by the guillotine, the palatine tonsils may recur, particularly after attacks of influenza, measles, or other infectious fever. Parents can be assured that this regrowth only occurs in a small proportion of cases, and that it can generally be avoided by a complete tonsillectomy, though it does rarely happen even after the most thorough operation.

7. The anxiety with regard to hæmorrhage is more deserving of consideration, although few fatal cases have been recorded; and, when we consider the enormous number of tonsils operated on, alarming

* J. H. H. Pearson, *Journ. of Laryngol.*, xxvii., 1912, No. 5, p. 244.

† *Trans. Amer. Laryngol. Assoc.*, xxxv., 1913, p. 282.

‡ *Brit. Med. Journ.*, Sept. 28, 1901, p. 892.

§ *Wien. med. Woch.*, 1910, No. 28; and *Epitome in Brit. Med. Journ.*, Nov. 19, 1910.

|| *Trans. Amer. Laryngol. Assoc.*, xxxiii., 1911, p. 222.

¶ *Ibid.*, xxxv., 1913, p. 60.

** *Trans. Amer. Med. Assoc.*, Section of Laryngol., lxiv., 1913, p. 180.

hæmorrhage is very rare. The risk of wounding the internal carotid—so dreaded by beginners—may be dismissed as groundless (*see* p. 399 and Fig. 200). The special causes of severe bleeding after tonsillotomy have been tabulated by Harmon Smith in the following order of their importance:—

- i. Hæmorrhagic diathesis, or hæmophilia.
- ii. Fibroid tonsils, where the fibrosis which replaces the glandular substance prevents the divided arterioles from retracting. This con-



Fig. 200.—Diagrammatic horizontal section of the pharynx, to show the anatomical relations of the tonsils and the retropharyngeal glands.

1, Vertebral column; 2 and 3, prevertebral muscles; 4, retropharyngeal lymphatic glands; 5, retropharyngeal space; 6, parotid gland; 7, lateral pharyngeal space; 8, internal pterygoid muscle; 9, pterygoid space; 10, buccinator muscle; 11, internal jugular; 12, nerves in carotid sheath; 13, internal carotid; 14, superior deep cervical lymphatic glands; 15, pharyngeal constrictor muscle, with pharyngeal aponeurosis on its inner surface; 16, posterior faucial pillar; 17, palatine tonsil; 18, anterior faucial pillar.

dition is the more manifest when a tonsil is divided instead of being completely extirpated.

iii. Age; occurring more in adults than in children. This is simply due to the increased fibrosis and greater vascular supply. Some practitioners are nervous of operating on patients over 20 years of age. Bleeding, certainly, may be more marked, but if the pathological condition warrants the removal of the tonsils, there is no age-limit to the performance of the operation, provided the surgeon is warned and armed for possible hæmorrhage.

iv. Sex; more frequent in males than in females.

v. Acute inflammation of the tonsils. Operation would always be avoided while this condition is present.

vi. Anæmia, when the fibrin-forming elements are wanting.

vii. Malignant disease of the tonsils, always associated with increased vascularity.

viii. Abnormalities in the distribution of the blood-vessels of the tonsil,* such as (a) abnormal distribution of the ascending pharyngeal artery, (b) abnormally large tonsillar artery, (c) abnormal internal carotid, (d) a large vessel in the anterior pillar of the fauces, (e) a large venous plexus at the lower and outer border of the tonsil.

ix. Arterio-sclerosis.

x. Injury to the anterior faucial pillar.

xi. The local use of cocaine and adrenalin, leading to secondary hæmorrhage.†

It will thus be seen that if the hæmorrhagic diathesis can be excluded the possibility of severe bleeding need not prevent the removal of diseased tonsils. Further security is obtained when patients are carefully prepared beforehand, and the precautions taken which are recommended to avoid bleeding in laryngological work. (Cf. p. 83.)

In 7,133 operations performed on the tonsils in the Royal Infirmary, Edinburgh, no patient was lost during the operation. One died seven days later, probably from delayed chloroform-poisoning; and a second case collapsed two days after the operation, probably from status lymphaticus.‡

The various methods employed for removing tonsils are described in the next chapter.

* De Santi, *Lancet*, Jan. 13, 1894.

† Harmon Smith, *Laryngoscope*, xiv., 1904, p. 121. (Gives a full bibliography of alarming cases of hæmorrhage following tonsillotomy.)

‡ J. K. Milne Dickie, *Journ. of Laryngol.*, xxix., April, 1914, p. 184.

CHAPTER XXV

REMOVAL OF TONSILS

Partial (tonsillotomy) or total (tonsillectomy) enucleation.—Before considering the principal methods of removal of the tonsils we must give some consideration to the question whether the tonsil should only be partially removed (tonsillotomy) or completely enucleated (tonsillectomy), and also discuss under what conditions one proceeding should be preferred to the other:

It was formerly taught that it was sufficient to remove so much of the tonsil as projected beyond the faucial pillars, since the rest of the gland would atrophy and cause no more trouble. This was the operation of former days, in which more or less of the tonsil was "sliced off" with a bistoury and pair of forceps, or amputated with a guillotine, and it was generally referred to as tonsillotomy or amygdalotomy. But it has long been recognized that, although this operation gave relief in many cases, there were others to which it was inapplicable, viz. those where the tonsils were too small, submerged, and adherent to enter the ring of the guillotine. Besides, quite a goodly number of cases suffered more, both locally and generally, after the partial removal, and often presented themselves to have the operation repeated. With the progress of medicine it was realised that while tonsillotomy was sufficient to relieve the obstruction to respiration caused by large, pedunculated tonsils, it was a very ineffectual operation for the smaller and more septic tonsils which more frequently called for extirpation. Opinions are still somewhat divided on the indications for tonsillotomy and tonsillectomy. Recent debates show that on the continent of Europe most laryngologists are inclined to reserve complete extirpation for special cases, and to continue with partial removal as the usual operation, particularly in children. As opposed to this view, the majority of laryngologists in England and America are of opinion that if a tonsil is sufficiently diseased to call for any interference it should be removed *in toto*.* The points at issue may be brought out by tabulating the objections to each of them as follows:—

* H. Burger and J. L. Goodale, and subsequent debate: *Proc. XVIIth Internat. Cong. Med.*, London, 1913, Section xv.; Part I., pp. 111-33, and Part II., pp. 171-87.

Objections to tonsillotomy (i.e. partial removal):

- (1) Is an incomplete removal of a diseased gland.
- (2) Is no guarantee against absorption through the remaining stump. In fact, after partial removal—
- (3) Local and general symptoms are apt to be aggravated or even initiated. Amongst these—
- (4) Adhesions are frequent between the faucial pillars and the tonsil remains, leading to obstructed pockets which favour retention, follicular attacks, quinsies, and absorption.
- (5) The operation frequently requires to be repeated—in 20 to 50 per cent. of hospital cases.

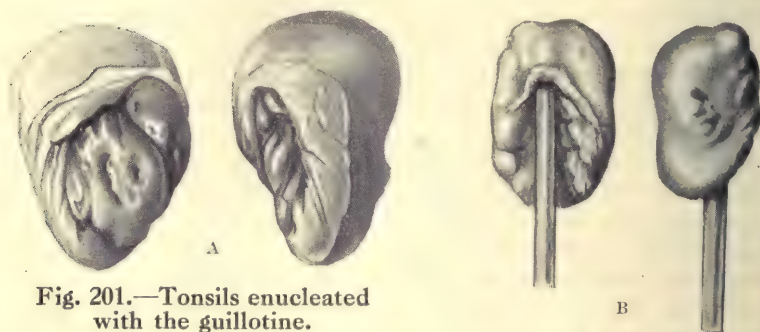


Fig. 201.—Tonsils enucleated with the guillotine.

A, From a girl without adenoid facies or voice, but with marked funnel chest. Note the intact capsule, the remains of the plica triangularis, the free opening into the tonsillar recess, and the large amount of tonsil which is submerged.

B, Deeply embedded and adherent tonsil, with a probe inserted into the supratonsillar fossa. The intact capsule, with some adherent traces of muscle, is well seen.

Objections to tonsillectomy (i.e. total enucleation):

- (1) Although we do not know the precise function of the tonsil, yet this ignorance is no reason for completely extirpating it.
- (2) It is a more difficult and more serious operation than tonsillotomy.
- (3) It requires a deeper narcosis—the chief danger of the operation.
- (4) More likely to be followed by alarming hæmorrhage.
- (5) More apt to lead to scarring and disfigurement of the palate and fauces, and hence—
- (6) More likely to alter the voice, and is therefore unsuitable for singers.
- (7) The capsule of the tonsil is viewed by some as helping to limit infection to the gland, and this defence should not be removed without good reason.

- (8) Requires both an expert anæsthetist and a skilled operator.

We may now meet some of the objections and try to arrive at some conclusions.

The indications for removal of tonsils were considered in the preceding chapter (p. 382). Unless these indications are decided our efforts to reduce temporary conditions should be persevered with, particularly if the age and resistance of the child encourage the hope of early involution. Tonsillotomy may be sufficient for large, pedunculated tonsils, where the gland tissue left behind is below the level of the crypts. It is indicated if the symptoms are only those of obstruction to respiration, and is the preferable method for professional singers.

Tonsillectomy is, of course, required when the disease is cancer of the tonsil, primary syphilis, or tuberculosis (i.e. local and latent tuberculosis, and not the acute pharyngeal tuberculosis which is occasionally met with in the last stage of phthisis). It is the only method possible for extirpating the shallow, buried, and adherent tonsil more frequently met with in adults. Enucleation is called for in chronic septic tonsillitis, recurring anginas or quinsies, chronic adenitis, attacks of glandular fever, and where the tonsil may be the port of entry of general infections such as nephritis, rheumatism, myocarditis, tuberculosis, etc. In fact, with the exception of the conditions mentioned above, where a trial might be given to partial removal, it seems wiser and safer to perform a complete enucleation whenever the indications given in the last chapter call for operation on the tonsil.

The advantages of tonsillectomy (enucleation) are :

- (1) It is a certain and complete surgical operation.
- (2) There is no recurrence of the diseased tonsil and the symptoms it caused.
- (3) It is not followed by adenitis.
- (4) In view of the suggestion that the tonsil is "a physiological wound in the throat," and a nidus for local and general infections, a patient is safer to be quit of tonsils completely, once they are diseased.
- (5) There is no evidence that a patient without tonsils becomes more susceptible to local or general infection.
- (6) The occasional scarring of the palate and fauces is absent or trifling in skilled hands. It produces no functional effects, except sometimes in the singing voice.
- (7) No other detrimental effects can be traced to enucleation.

Methods of removal.—It will be sufficient to consider the methods of complete enucleation, as tonsillotomy is, after all, only a partial removal. The complete removal is one of the oldest in surgery, having been practised by Celsus before the Christian era (B.C. 53—A.D. 7).^{*} In 1901 I called attention to the operation of entire removal in certain cases by dissection,[†] and in the first edition of this textbook I pointed out that, if properly used, the guillotine will completely enucleate the majority of tonsils. In this country George E. Waugh, in 1909, called attention to the unsatisfactory work frequently done by the guillotine, and recommended enucleation by dissection.[‡] It will be described later (see p. 400), as it is now generally superseded by enucleation with the guillotine. In using this instrument for the complete operation, I recommended the use of a vulsellum or tenaculum for dragging the tonsil, with its capsule, within the grasp of the tonsillotome. Whillis and Pybus described how the same result could be obtained by using the forefinger to dislocate the gland from its socket and push it within the ring;[§] and Sluder showed that the tonsil could be crowded into the guillotine by using a point on the lower jaw to fix it.||

The operation as usually performed, with one or other of these slight variations, will be described first.

1. Tonsillectomy with the guillotine.—Tonsillotomy in children is seldom performed nowadays, except under an anæsthetic, and in conjunction with the removal of adenoids (p. 336). If the tonsils are so large as to interfere with the manipulation of the adenoid curette, they may be removed first; but if the adenoid growth has first been operated on, the patient is already lying rotated over on the right side (p. 338). The gag is generally introduced from the left side when the opposite tonsil is being operated on, and from the right side when the left tonsil is being excised. But if, instead of a Mason's, Ferguson's, or similar gag, we employ one of the pattern of Doyen's, or O'Dwyer's—which I find very suitable for this operation—the whole proceeding can be done without shifting the instrument. The lower (right) tonsil is first removed. The empty tonsil-socket is then plugged with a honeycomb throat sponge, and firm pressure kept up for a minute or two, when the bleeding will be sufficiently arrested to allow us

* Celsus, "Of Medicine," translated by James Greive, M.D., Edinburgh, 1814, p. 338. ("Tonsils that are indurated should be disengaged all round by the finger and pulled out.")

† StClair Thomson, *Trans. Med. Soc., London*, xxiv., 1901, p. 302.

‡ George E. Waugh, *Lancet*, May 8, 1909, p. 1314.

§ Samuel S. Whillis and Frederick C. Pybus, *Lancet*, Sept. 17, 1910; and *Brit. Med. Journ.*, Nov. 25, 1911, p. 1402.

|| Greenfield Sluder, *Journ. Amer. Med. Assoc.*, lx., March, 1913, pp. 650-4.

to examine the removed gland and see that the whole tonsil with its capsule has been completely enucleated, and that there is no excessive hæmorrhage. In this way there will be no great flow of blood to obscure the field of operation when the upper (left) tonsil is next removed, while the patient and the gag remain in the same position. The whole proceeding is most satisfactorily carried out under the good illumination of a frontal search-light (Fig. 10, p. 15), otherwise the operating table must be placed parallel to a good light and with the patient's right side next the window.

The selection of a suitable guillotine, and the method of using

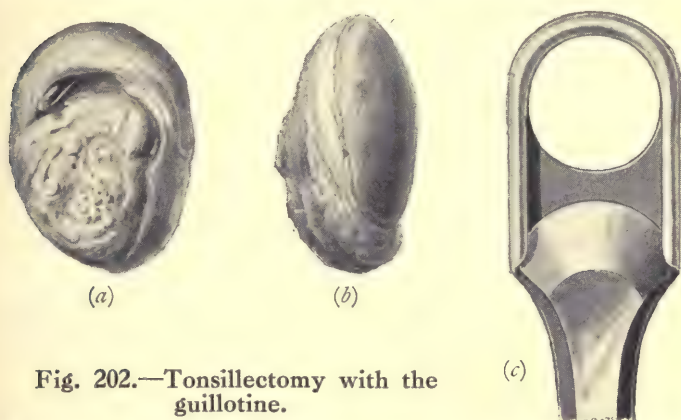


Fig. 202.—Tonsillectomy with the guillotine.

- (a) Shows the free presenting surface of a buried, adherent tonsil (natural size) affected with chronic lacunar tonsillitis. A probe is inserted into the supratonsillar fossa. Note the adherent plica triangularis.
- (b) Shows the anterior and outer surfaces of the excised tonsil, with its smooth capsule, and, at the lower end, the free, pendulous portion of the gland.
- (c) Shows the exact size of the guillotine with which this tonsil was excised. Note how much smaller the ring of the guillotine is than the gland it was made to encircle.

it, are all-important. Mackenzie's pattern, as modified by Charles Heath, is warmly recommended (Figs. 202 and 203). One with a large fenestra should be avoided. The smaller the guillotine which will embrace a tonsil, the more complete and satisfactory will be the enucleation. In fact, the most suitable instrument for any case is one which will *not* admit the tonsil when directed flat against the surface of the gland, but which will only embrace the neck of the tonsil by threading the latter through it. An instrument with an opening measuring $\frac{3}{4}$ inch will be found satisfactory for the majority of cases (Fig. 202). Some surgeons prefer that the cutting edge of the blade should be dulled, or even blunt.

An assistant, or the anæsthetist, standing behind the patient, steadies the head and, if required, makes firm pressure just beneath

and behind the angle of the jaw. Now, the point in which the use of the guillotine for enucleation differs from the older method, when it was used simply for removing a portion, is this: it is the distal side of the shaft, i.e. the one opposite to the handle, which is directed on to the tonsil, for this manner of using it gives the leverage necessary for digging the tonsil out of its bed. The guillotine, then, is taken in the operator's right hand, much as he would hold a revolver, and is used as a tongue-depressor to

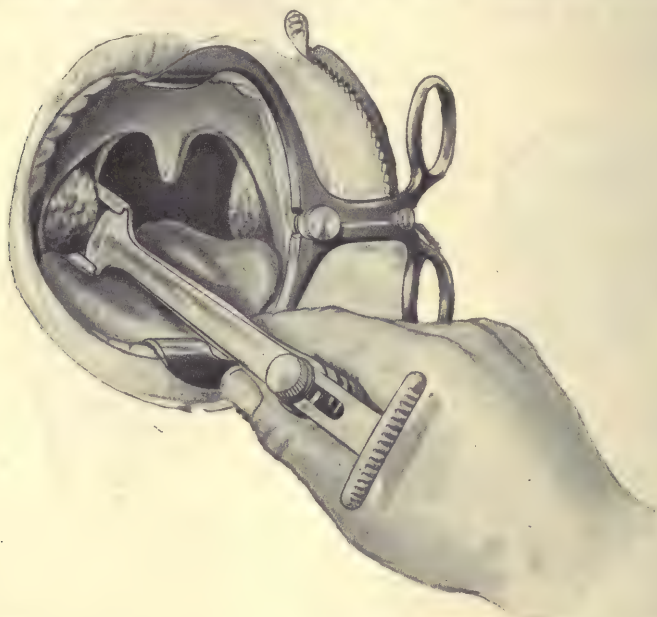


Fig. 203.—Enucleation of the tonsil with the guillotine.

First step: Threading the tonsil through the ring of the guillotine from the lower margin. Note that the guillotine is used with the distal side towards the tonsil, and the handle pointing towards the opposite angle of the mouth.

expose the lower margin of the right tonsil, beneath which it is pressed obliquely and directed upwards and outwards so that the tonsil is, so to speak, threaded through the guillotine ring and lifted upwards and outwards till it is pressed against the anterior faucial fold (Fig. 203). At the same time, the operator, by pressing with the tip of his left forefinger on the outer and upper part of the anterior faucial pillar, helps to dislodge the tonsil from its socket and stroke it through the ring of the guillotine. A more complete embrace is effected if the handle of the instrument is sloped across to the opposite angle of the mouth. At this moment

the thumb of the right hand is employed gradually to press in the blade of the instrument (Fig. 204). As soon as it is felt that the tonsil is engaged, without risk of its slipping out again, the pressure with

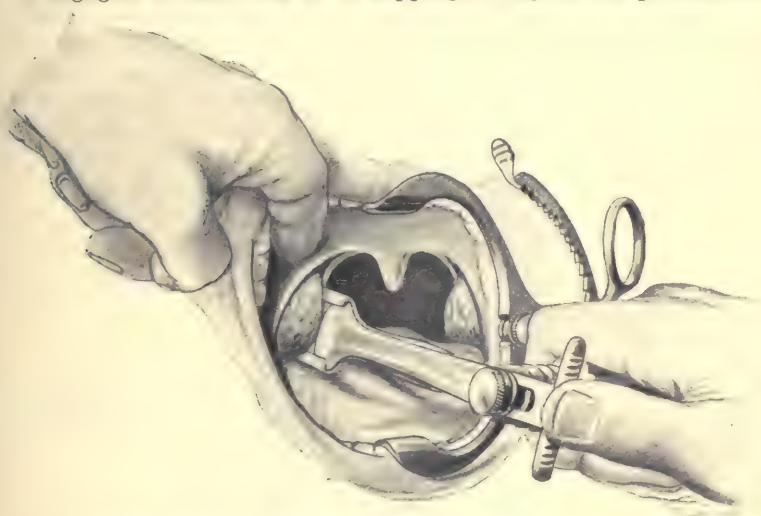


Fig. 204.—Enucleation of the tonsil with the guillotine.

Second step : While the guillotine is being threaded on the front of the tonsil, the operator's left forefinger dislodges the tonsil from its socket above and pushes it well through the ring of the instrument,

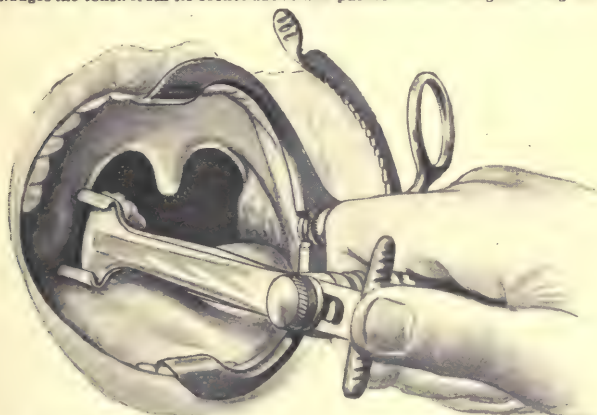


Fig. 205.—Enucleation of the tonsil with the guillotine.

Third step : The tonsil has been crowded right through the ring of the guillotine and is seen projecting on the other side. The blade of the instrument has been pressed down far enough to engage the tissues behind the capsule of the tonsil and so prevent it from slipping back into the tonsillar socket. A dimple in the anterior faucial pillar shows the traction on the retrocapsular tissues, and is a sign that the whole tonsil with its capsule has been surrounded. The operation is now completed by driving the guillotine blade well home with the thumb of the right hand reinforced by the thumb of the left.

the left forefinger is released (Fig. 205) and both hands can be used to drive home the blade, while the guillotine is given a half-turn in

rotation, so that whereas the surface towards the tonsil at first faced upwards and outwards, it finishes by looking downwards and inwards. This movement more effectually digs the tonsil from its bed.

For the remaining (the left) tonsil the patient is now rolled on to his back. If both hands are fairly deft the left is used to hold the guillotine, while the right forefinger steadies and thrusts

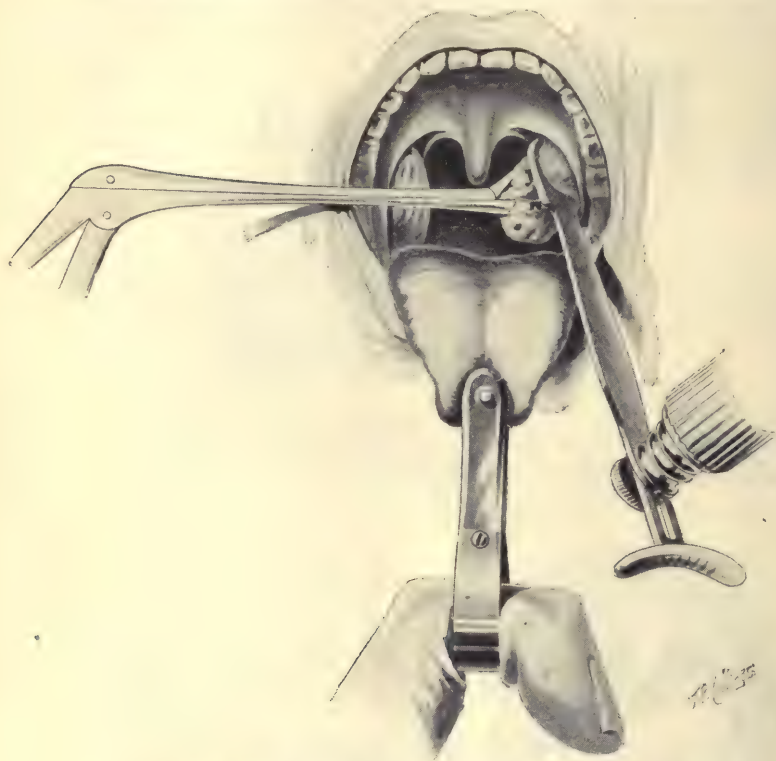


Fig. 206.—Excision of the tonsil with the guillotine.

A Hartmann conchotome is passed through the ring of the guillotine, so as to seize the tonsil and drag it from its socket. The guillotine is then threaded on to the tonsil, passing from below upwards and outwards. The tongue-clip is not generally required in this operation, but the drawing shows how it secures without injuring the tongue, which is held forwards by the anæsthetist.

the tonsil into the ring. But by moving nearer the patient's head it is quite possible to use the right and left hands for the second tonsil just as for the first. This may be facilitated if one of the guillotines with scissor-action handles is employed.*

Sluder points out that the tonsil is posterior to and below an eminence on the lower jaw, which he calls the alveolar eminence

* J. F. O'Malley, *Proc. Roy. Soc. Med.*, Laryngol. Section, vi., Dec., 1912, p. 51.

of the mandible. This is just above the mylo-hyoid line, being caused by the prominence of the last molar tooth in its socket, and is more marked in the young. Having introduced the guillotine and encircled the tonsil as already described, Sluder moves it forwards and upwards till it can be pressed and fixed against the alveolar eminence, which helps further to stuff the gland well through the ring. He also suggests that the operator's index-finger can assist in thrusting it through, as advised by Whillis and Pybus.

The same result can also be secured by the method I have

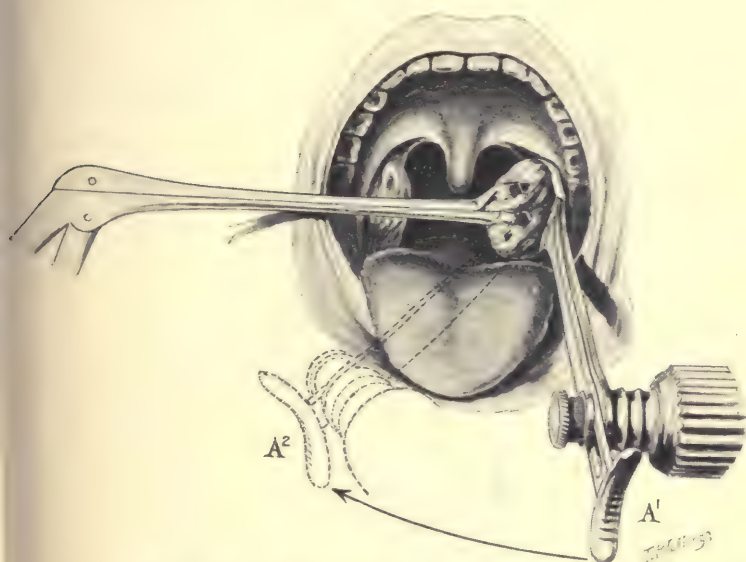


Fig. 207.—Excision of the tonsil with the guillotine.

When the tonsil has been embraced in the ring of the guillotine (see Fig. 202), the extremity of the instrument is pressed very firmly outwards, while the handle of the instrument is carried across the mid-line of the body, from A¹—A².

described and practised for many years (Figs. 206 and 207). The guillotine is used, in my method, with the surface on the same side as the handle next to the tonsil. A vulsellum forceps, or Hartmann conchotome, is passed through the ring of the instrument so as to seize the adherent tonsil and drag it out beneath the blade, when the operation is completed as already described. This procedure may be unnecessary in well-pedunculated tonsils, such as are generally met with in children, and is not always required by expert operators in constant practice; but it will be found very useful by the less experienced, and in those cases—more frequent

in adults—where the tonsils are flat and embedded, or, owing to previous tonsillotomies, are so closely adherent to the pillars all round that they refuse to be pressed or coerced from their beds. It also entails less risk of damage to the faucial pillars, and does not require a deep anæsthesia.

If not already excised, any adenoids can be operated on at this stage, while the patient is lying on his right side (cf. p. 338).

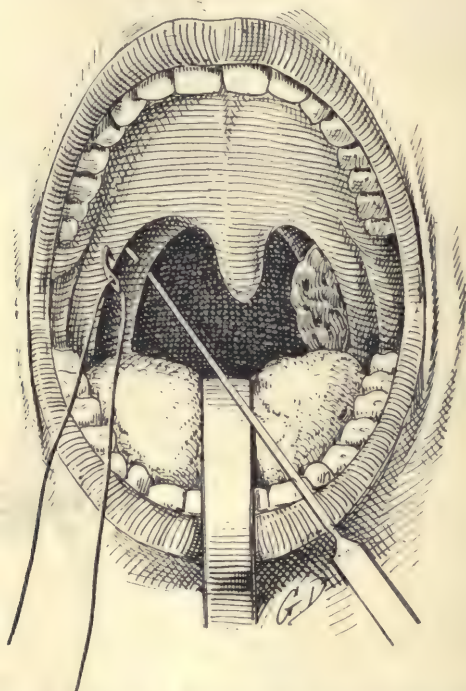


Fig. 208.—Arrest of hæmorrhage after tonsillectomy.

Two silk ligatures are passed through the anterior and posterior faucial pillars, with the help of a needle and needle-holder, or a curved needle such as that of Trelat, used in submucous resection of the septum, and shown in the above illustration.

Immediate result.—Whatever method of operation is employed, the excised tonsil should be at once examined. If the operation is perfectly successful, the tonsil is found to be complete within its intact capsule (Fig. 201, p. 388). If any portion of the capsule is missing, it must be removed by a second application of the guillotine. The portion which is apt to be left at the first stroke will often be found behind and adherent to the anterior pillar, or down in the hyoid fossa in the neighbourhood of the

lingual tonsil. It is in these corners that the use of the vulsellum and a still smaller guillotine is helpful (Fig. 202). Further assurance is obtained by a digital examination of the emptied tonsil socket, and by careful sponging and inspection, which will show a smooth cavity, free of all trace of gland tissue or tonsil capsule, and bounded only by bare muscle tissue.

It is sometimes recommended to divide the adhesions of the tonsillar pillars. This is seldom necessary, if care is taken not to use too large a guillotine and the above method is employed.

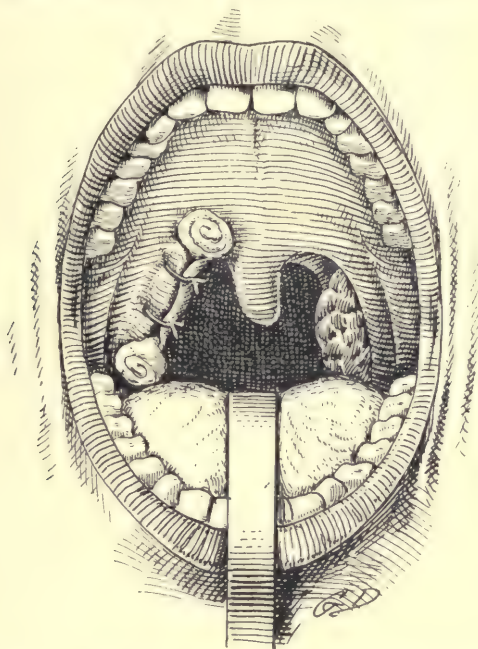


Fig. 209.—Arrest of hæmorrhage after tonsillectomy.

A tightly-rolled pencil of cotton-wool or a compressed gauze pledget is packed into the tonsillar socket, and tied in position with the two silk ligatures, which are then cut short. The compress is removed at the end of 24 or 48 hours.

Ingenious instruments have been devised by La Force and Elphick to minimize the risk of hæmorrhage. In these instruments the shaft contains a blunt crushing blade, which first strangles the circulation in the stump of the tonsil, and also a sharp cutting blade which then divides it.*

* La Force, "La Force Hæmostat Tonsillectome," *Laryngoscope*, xxv., Jan., 1915.

W. Hill and G. Elphick, "On the Minimizing of Hæmorrhage in Extirpation of the Tonsils, with especial reference to the Employment of the Hæmostatic Guillotine," *Journ. of Laryngol.*, xxix., Dec., 1914, No. 12, p. 545.

Hæmorrhage is brisk at first, but generally ceases spontaneously if assisted by free application of iced water (*see* p. 84). When the patient is put back to bed he should be placed well over on one side with the face directed downwards, otherwise blood might pass unnoticed into the stomach, when the continuance of the hæmorrhage would only be announced by pallor, quick pulse, and the vomiting of blood. If the bleeding does not cease in a few minutes, or if it recurs, the wound should be inspected under a good light and well sponged. Bleeding from a single vessel—generally a muscular branch in one of the faucial pillars*—is met by clamping it with a long-handled pair of pressure forceps. If there is general oozing, firm pressure must be kept up uninterruptedly for fifteen to thirty minutes with a sponge or a pad of lint moistened with adrenalin chloride or peroxide of hydrogen, and held in position by a tonsillar hæmostat (Fig. 210),

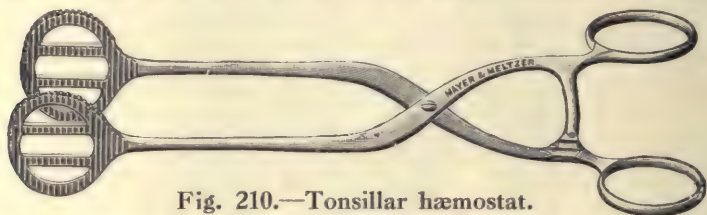


Fig. 210.—Tonsillar hæmostat.

a pair of forceps, or the forefinger. A dose of lactate of calcium (gr. xx-xxx) is given, and, if necessary, subcutaneous or rectal injections of normal saline solution. The special hæmostat for exerting tonsillar pressure should always be at hand (Fig. 210).

In many cases there is nothing better or simpler for continuous oozing than a hypodermic of morphia, $\frac{1}{12}$ – $\frac{1}{8}$ gr. in children, and $\frac{1}{8}$ – $\frac{1}{3}$ gr. in adults. This may be given, with atropine, if bleeding does not cease within fifteen minutes, and it is often wise to administer it as a preventive in patients with a quick pulse, or to those who are restless or excited.

In the case of a hæmophilic adult, who was unfortunately operated on in my clinic, repeated hæmorrhage was finally controlled by temporarily suturing the anterior and posterior pillars together over a firm pencil of tightly rolled cotton-wool (Figs. 208 and 209).† Ligature of the external or common carotid is very rarely called for.‡

* J. Leslie Davis, *Laryngoscope*, xxiv., March, 1914, No. 3, p. 161.

† Heermann, *Arch. f. Laryngol.*, Bd. xii., Heft 3, 1902.

Escat, *Presse Méd.*, Août 30, 1902, No. 70.

J. C. Henke, *Monats. f. Ohrenheilk.*, 1907, No. 2.

‡ Lee Cohen, "Postoperative Tonsillar Bleeding," *Trans. Amer. Med. Assoc.*, Section of Laryngol., 1909, p. 84.

(For other directions in the arrest and prevention of hæmorrhage, *see* p. 83.)

Much unnecessary dread has been caused by the suggestion that the carotid artery lies close to the base of the tonsil. As a matter of fact the internal carotid is separated from the tonsil by the thickness of the pharyngeal aponeurosis, the superior constrictor, the stylo-pharyngeus muscle, and a quantity of loose areolar tissue, so that an interval of 15 to 25 mm. ($\frac{3}{4}$ to 1 inch) separates the gland from this large vessel.* (Fig. 200.)

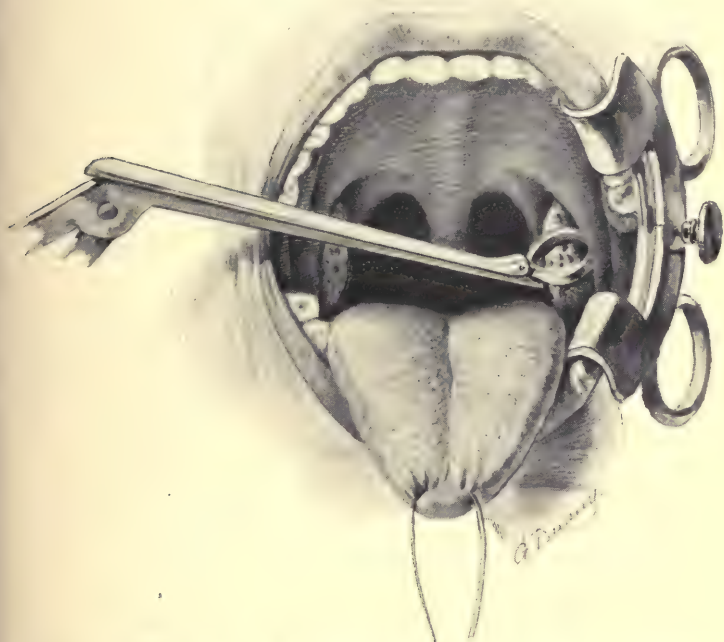


Fig. 211.—Enucleation of the tonsil by dissection.

Shows the tongue drawn forwards by a silk ligature, and the embedded tonsil seized with ring forceps. (Wainwright.)

Surgeons who are not kept in constant practice with the guillotine may find it easier to work with the modification of Reiner or Matthieu. But the pronged-fork arrangement for dragging the tonsil from its bed is awkward to those not accustomed to it, as it may injure the other parts or the operator's own finger.

* W. L. Ballinger, "The Clinical Anatomy of the Tonsil," *Trans. Amer. Laryngol. Assoc.*, 1906, p. 121.

Charles M. Robertson, "Anatomy and Physiology of the Tonsil," *Trans. Amer. Med. Assoc., Section of Laryngol.*, 1909, p. 36.

2. **Enucleation by dissection.**—In nearly all cases a general anæsthetic is required. The tonsil is seized and steadied with a Hartmann conchotome, so that the mucous membrane above the upper pole can be divided with a pair of blunt-pointed scissors, curved on the flat, or with a pair of fine-toothed dissecting forceps. This allows of the forefinger being inserted between the pharyngeal wall and the capsule of the tonsil, so as to shell it out of its bed.* If it remains

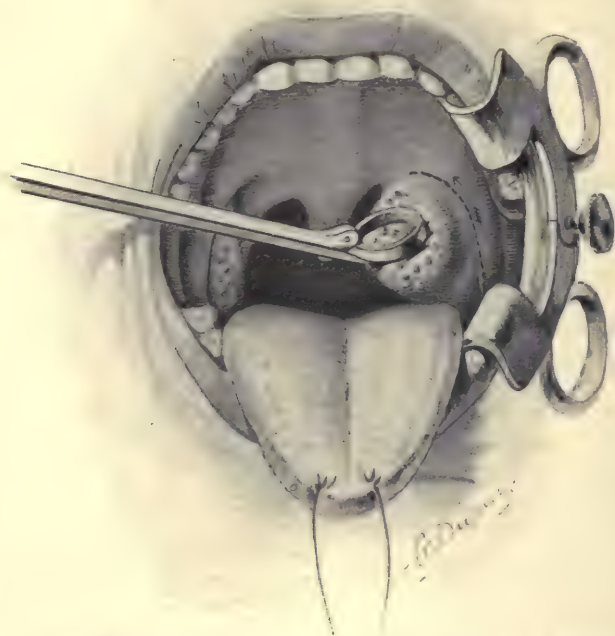


Fig. 212.—Enucleation of the tonsil by dissection.

Shows tonsil drawn inwards with the embedded part bulging beneath the anterior pillar of the fauces. The dotted line indicates the line of incision down to the capsule. (*Waugh.*)

attached below, where the tonsil shades into the lingual tonsil at the base of the tongue, it is separated with a wire snare (Figs. 211, 212, and 213).

Although a rapid and easy proceeding in some cases, enucleation by dissection is apt to be troublesome if the capsule is missed and the soft and friable tonsillar tissue breaks up into pieces which require removal by morcellement. It leaves the throat much sorer than does the guillotine, as the soft palate and uvula are apt to get dragged on and bruised, and in unpractised hands the faucial pillars may be

* George E. Waugh, *Lancet*, May 8, 1909, p. 1314.

stretched and torn. As performed by many of its advocates, this operation requires a degree of chloroform anæsthesia so profound that it cannot be free from anxiety.*

3. **Morcellement.** **Indications.**—The tonsil may be sessile, lobulated, large, flat, or hidden by the pillars of the fauces, to which it may be more or less adherent. These cases can be treated with

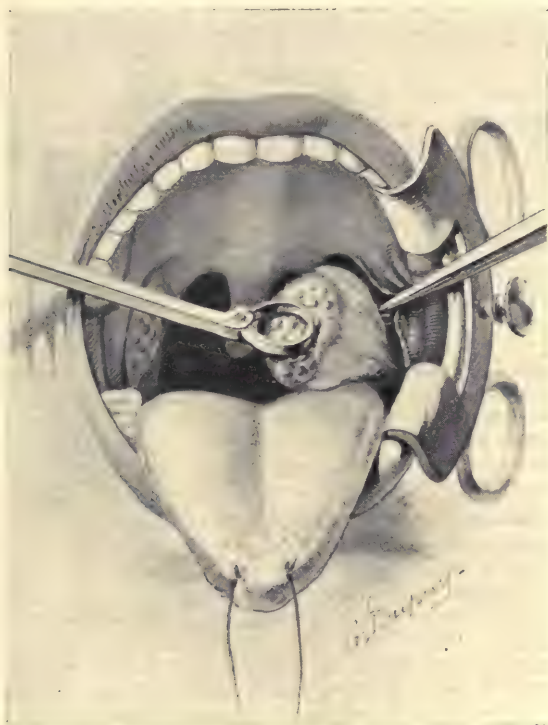


Fig. 213.—Enucleation of the tonsil by dissection.

The large encapsuled part of the tonsil is now revealed, and is being shelled out of its pharyngeal bed. (*Waugh.*)

punch-forceps, and morcellation is a favourite method in France for removing tonsils of any shape and at any age.†

Method.—Removal with punch-forceps can be performed under general anæsthesia or cocaine. The “morcelleur” should have its blades sharp and exactly fitting, so that masses of tonsillar tissue are evenly cut through, otherwise untorn portions are dragged on and have to be twisted off. If the blades are only manœuvred in a vertical plane there is little danger of injuring neighbouring parts, particularly the faucial pillars. Besides the large instrument of Ruault, the

* *Brit. Med. Journ.*, Nov. 19, 1910, ii., p. 1621. (Discussion at annual meeting.)

† A. Ruault, *Rev. Hebdomadaire de Laryngologie*, 1902, No. 35.

nasal conchotome of Hartmann, or an instrument a little larger, will be found useful.

4. **The cold-wire snare.**—This method may be employed, in the case of adults, when there is any fear of hæmorrhage, or where the tonsils are fairly well pedunculated. The tonsil is seized with a vulsellum forceps and dragged from its socket. If necessary, its base is freed from adhesions by a cutting hook. The noose of the cold-steel-wire snare is then pressed down close on to the pedicle, and slowly tightened. This part of the process somewhat prolongs the patient's anxiety, but there is no pain nor risk of hæmorrhage nor danger to neighbouring parts, and the method is highly praised by those who practise it. Some skill is needed to draw out the tonsil and strangle its base; the wire loop is apt to slip off the face of the tonsil; and there is the chance of the wire jamming, so that it will not cut through and is very awkward and alarming to detach. The method, in children, has no advantage over the guillotine.

5. **The galvano-caustic snare.**—This requires an electric installation and a suitable cautery handle. The method is only suitable where the gland is pedunculated or can be drawn into the loop. The latter is applied cold, pressed well down to the root of the tonsil, and pulled tight. The current is then switched on, but it is important not to let the wire get too hot, and so fuse, or cut through the gland too quickly and thus cause hæmorrhage. To avoid this the current should be frequently interrupted, so as just to keep the wire at a dull-red heat.

The method has little to recommend it. It is troublesome, alarming, does not ensure against bleeding, is apt to be followed by secondary hæmorrhage, and leaves a painful wound with much reaction.*

6. **Galvano-cautery puncture.**—The reduction of the tonsil by electric cauterization requires repeated applications at intervals—six, ten, or even twenty sittings being required. In addition to this drawback, it is apt to produce adhesions between the tonsil and the faucial pillars, or scars which narrow or obstruct the orifices of the tonsillar crypts. Many who once employed the method have now nearly altogether renounced it (Moure). Although unsuitable for a diseased tonsil, it may find its application in slight forms of simple chronic enlargement or in patients who are "bleeders."

Treatment after removal of tonsils.—The removal of tonsils is so frequently associated with the operation for naso-pharyngeal adenoids that readers are referred to p. 341 for most of the details of after-treatment. The parts are kept at rest by the avoidance of talking and of mastication. Cold or iced drinks of water, lemonade, barley-water, or tea, and soft pulpy foods are ordered for a day or two. Ice can be sucked; a hot fomentation, or large mass of cotton-wool fixed firmly to the angle of the jaw, will give relief. The mouth is kept cleansed by some alkaline lotion and antiseptic lozenges (Formulæ 28, 29, 37, 43, and 46, p. 805). No attempt should be made to detach any slough which

* M. Constantin, *Ann. des Mal. de l'Oreille*, xxxii., i., 1906, No. 2, p. 150.

may form; it can be disinfected and broken up by painting with peroxide of hydrogen. Foulness of breath, if present, is generally due to gastro-intestinal sepsis, and calls for an aperient; it can generally be avoided by a dose of grey powder and cascara on the same evening. A septic rash appearing after tonsillotomy must be distinguished from scarlatina.*

The false membrane which sometimes forms on tonsillotomy wounds may give rise to a quite unnecessary suspicion of diphtheria. Diphtheria-like bacilli may be found in these dirty-grey sloughs, but they are not of the Klebs-Löffler variety. The membrane is caused by ordinary pyogenic organisms, and is a product of inflammation containing leucocytes, fibrin, and necrotic tissue.† It will clear up in a few days with frequent gargling of a chlorate-of-potash or antiseptic lotion (Formulæ 29 and 37, p. 806). If the hollow of the tonsil-socket is filling up with irregular granulations it should be painted with peroxide of hydrogen (5 vols. per cent.), followed by argyrol (25 per cent.) or nitrate of silver (gr. xx to 3i).

* W. Wingrave, *Journ. of Laryngol.*, Oct., 1901, p. 534.

† L. Harmer, *Wien. klin. Woch.*, Sept. 20, 1900, No. 38.
P. Cernat, *Bull. de Laryngol.*, vi., 4^{me}, 1903, p. 254.

CHAPTER XXVI

PERITONSILLAR ABSCESS

Synonym.—*Quinsy; cynanche.*

Definition.—Many of the synonyms given in textbooks are incorrect and misleading. Thus, such terms as abscess of the tonsil, suppurating tonsillitis, phlegmonous tonsillitis, and angina tonsillaris imply that the disease is situated in the tonsil itself; whereas, the condition so readily recognized as a quinsy is due to inflammation and the formation of pus in the tissues adjoining, but outside, the tonsil.

Etiology.—Peritonsillar abscess is rarely met with in childhood, or over 60 years of age. It is most common between 15 and 35. The statistics of Morell Mackenzie indicate that it is somewhat more common in males than in females, and is most frequent in the autumn and spring. There is said to be an hereditary predisposition to it.

Many writers (Bosworth, McBride, Bishop, Kyle, Ballenger, Shurly, Lennox Browne) look upon rheumatism as a frequent etiological factor, but the views on this subject have been somewhat obscured by confusing acute tonsillitis and quinsy in one description. The symptoms which somewhat resemble rheumatic fever can be equally well attributed to absorption from a septic focus; and there seems no reason to regard a quinsy otherwise than as due to local septic infection. Infection appears to occur through the supratonsillar fossa, and adhesion between the tonsil and the plica semilunaris would account for the fact that quinsies generally occur in those who have repeatedly suffered from tonsillitis, and would also explain the tendency for them to recur in the same subject. There is no relation between the size of the tonsil and the occurrence of quinsy; indeed, an abscess more frequently occurs in association with small, irregular, unhealthy-looking tonsils, and I have often met with it in patients in whom the tonsils had been removed level with the pillars of the fauces. In such cases, however, some tonsillar tissue is always to be found, generally adhering to the anterior pillar, and it is very common to find that the upper extremity of the gland has been left and obstructs the exit of the supratonsillar fossa. Among local predisposing causes are septic conditions of the mouth and teeth, suppuration in the nose or middle ear, and septic infection after operations on the nose. A subacute follicular tonsillitis often precedes or accompanies an attack.

A peritonsillar abscess occurs as a rare complication of diphtheria.*

* T. Hubbard, *Trans. Amer. Laryngol. Assoc.*, 1899, p. 69.

The collection of pus may be (*a*) above, (*b*) behind, or (*c*) external to the tonsil. The abscess is antero-superior in 98 per cent. of cases.*

Symptoms.—An attack may follow on one of lacunar tonsillitis, or it may occur primarily. It then begins with general malaise, fever, shivering, and possibly a distinct rigor, to be rapidly followed by acute pain behind the angle of the jaw, radiating up to the ear, and involving the neck on the same side. Dysphagia soon becomes intense, so that the patient will allow the tenacious muco-saliva to dribble from his open mouth, rather than endure the pain entailed by attempts to swallow or expectorate it. The accumulation of secretion in the pharynx adds a rattling character to the peculiar, thick, dead tone of speech. The head is held stiffly forwards and inclined to the affected side, while any rotation only takes place at the shoulders. The sense of smell is diminished and taste is nearly lost. The breath is very offensive; the complexion frequently earthy and sallow; and the anxious and worn expression shares in making up a typical appearance.

Examination.—The lymphatic glands at the angle of the jaw are swollen and tender, while the whole side of the neck and the chain of glands along the sterno-mastoid are also very painful. There is a diffuse tender thickening of the side of the neck, and of the submaxillary, parotid, and occipital glands.† This inflammatory infiltration may render it almost impossible for the patient to open the mouth more than half an inch, so that great assistance is obtained by good illumination of the tonsillar area. The isthmus of the fauces is then seen to be festooned with loops of ropy mucus, and considerably narrowed by the bulging of the anterior pillar and neighbouring portion of the soft palate. This swelling brings the region in question much nearer the front teeth, and, as it rests on the base of the tongue, the tonsil itself is pushed inwards and even backwards. The tonsil may present the appearances of lacunar tonsillitis, or may be only red and congested, or may not be swollen at all (Fig. 214). The surface of the tonsil and abscess area may be coated with a deposit of mucus resembling a false membrane but readily detached.

There is nearly always œdema of the uvula and the edge of the soft palate, especially on the affected side. (Edema of the larynx is rare, but when it occurs it may threaten life.‡

The tongue is coated with a thick creamy fur, and protruded with the greatest difficulty. Anorexia is almost complete; thirst is marked; efforts at coughing or clearing the throat are dreaded

* Moritz Schmidt, "Die Krankheiten der oberen Luftwege," vierte Auflage, p. 212.

† Brunel, Thèse de Bordeaux, 1899.

‡ Maughan, *Brit. Med. Journ.*, March 7, 1903.

from the pain they excite; the skin is hot and moist; the pulse is full and bounding; and the temperature in the early stage may reach 102° F., or even 105° F. The urine is scanty and loaded with urates, while the bowels are generally confined. The patient rapidly loses weight, and the sleepless nights following on suffering days help to complete his physical and mental prostration.

The course of the disease may last from five to ten days:

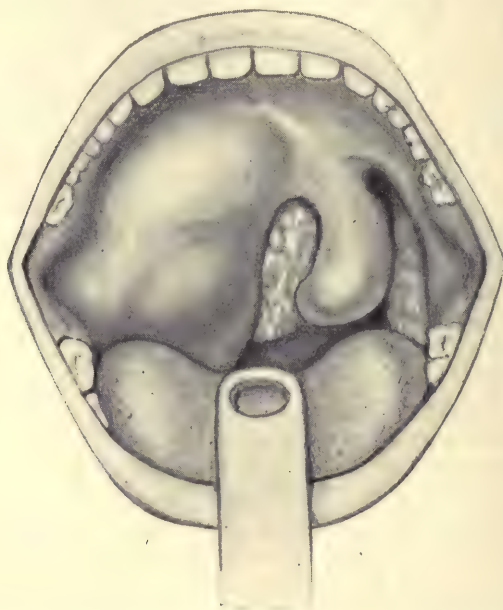


Fig. 214.—Acute peritonsillar abscess in a female patient aged 26.

The abscess burst spontaneously through the supratonsillar fossa.

As the abscess matures there may be some abatement of symptoms, but real relief only follows on the rupture of the abscess cavity. This may take place through the tonsil itself, into the supratonsillar fossa, or through the anterior pillar and soft palate. In the latter case the opening through which the pus oozes is often quite small and has to be looked for carefully (Fig. 215). It is generally found in the situation indicated as the best point for opening the abscess (p. 410), and, as the swelling collapses, this opening often sinks until it comes near the last molar tooth. When the abscess discharges spontaneously through the supratonsillar fossa, the pus often escapes observation as it trickles down into the

throat behind the swollen tonsil and is swallowed. With the bursting of the abscess the general symptoms cease at once, and the local discomfort abates rapidly. The patient soon recovers from his depression, but some days or weeks are required before he returns to his normal health.

In the majority of cases only one side is involved; but occasionally an attack on the opposite side follows just as the first is subsiding.

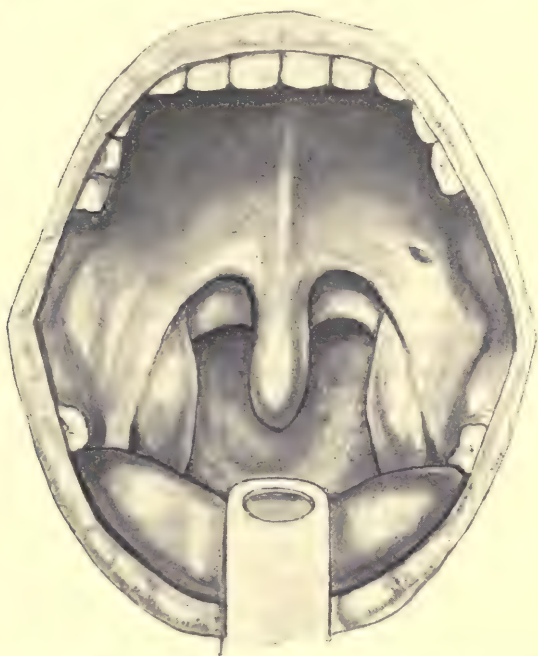


Fig. 215.—Spontaneous opening made by a peritonsillar abscess.

When the suppuration takes place behind the tonsil it forms a less tense and more irregular sausage-like swelling in the lower part of the posterior pillar of the fauces, and the tonsil may be pushed forwards. In this situation it develops more slowly, and is less acute. The patient is then better able to open his mouth, but there may be more impairment of respiration and speech owing to the nearer approach of the inflammation to the side of the larynx. When the abscess forms externally to the tonsil the pharyngeal discomfort is less marked, the progress of the disease is more tedious, and the symptoms point to a deep suppuration in the neck. It may develop into a "chronic abscess" (Garel).

Prognosis and complications.—Unless relieved, the course of the affection may extend to seven or ten days. Trousseau said that in his long medical career he had never seen anyone die of a quinsy. In the majority of cases this is quite correct; but fatalities have occurred, chiefly in the external form of abscess. When both sides are attacked simultaneously the symptoms are naturally more distressing and alarming, but if the abscess is in the usual situation a good prognosis can be given. Oedema of the larynx is said to have occurred in adults, and a few cases of tracheotomy have been reported as necessary in young children. I have not met with instances of either. Death has been known to follow the spontaneous bursting of a large abscess and the flooding of the trachea with pus, generally during sleep.*

Thrombosis of the internal jugular vein, with septic cervical cellulitis, may occur, even after an abscess has been evacuated.† Hæmorrhage from a quinsy may occur unexpectedly. Autopsies show that blood may come from the internal carotid, a branch of the external carotid, the palatine branch of the ascending pharyngeal, the lingual, or the inferior palatine branch of the facial. There are published records of 51 cases in which severe bleeding was associated with the opening of a quinsy; 23 recovered, and 28 died—a mortality of 54·8 per cent. The hæmorrhage may be primary or secondary. It may also occur when an abscess opens spontaneously,‡ and is a very good reason for incising the collection of pus in good time. For this alarming accident ligature of the internal carotid is generally required, but the dangers of this procedure are not to be underestimated. In the 51 published cases the common carotid was tied 16 times with 11 recoveries.§

Suppuration of the cervical glands is said to have occurred in rare instances. In those cases where deep suppuration in the neck, mediastinal complications, endocarditis, appendicitis, albuminuria, or other indications of general sepsis have occurred, they were probably due to the occurrence of suppuration external to the tonsil, or else to some form of septic pharyngitis (cf. p. 443). Amongst possible complications are septicæmia, broncho-

* Morell Mackenzie, "Diseases of the Throat and Nose," vol. i., p. 54. London, 1880.

Hilton Fagge, "Principles and Practice of Medicine," 1st ed., vol. ii., p. 104. London.

A. Lyons, *Lancet*, Sept. 20, 1902.

F. de Havilland Hall, *ibid.*, Sept. 27, 1902.

Annual of the Universal Med. Sci., 1889, iv., E. 13.

† M. R. Ward, *N.Y. Med. Journ.*, Oct. 14, 1899.

‡ T. Bobone, *Bollettino delle Mal. dell' Orecchio*, 1905, No. 10.

§ James E. Newcomb, *Journ. of Laryngol.*, xxiii., 1908, No. 6, p. 289.

pneumonia, thrombo-phlebitis,* burrowing in the neck and pyæmia, suffocation from pressure (in children), secondary œdema of the glottis, and acute œdema of the lungs of sudden onset.†

Diagnosis.—There may be nothing characteristic for twelve or twenty-four hours after the initial symptoms, but at the end of that time the typical appearances are evident.

Treatment.—Trousseau held that nothing curtailed the course of a quinsy. Some observers, however, think they are able to abort it, and with this object have prescribed tincture of aconite (m̄i every hour), salicylate of soda (gr. x), belladonna, tartar emetic (gr. $\frac{1}{16}$ every two hours, with liq. ammon. acetatis ʒss), red iodide of mercury, and protoiodide of mercury. Sometimes two or more of these drugs are combined, aconite with salicylate of soda, or belladonna and a mercurial salt. Locally, applications of argyrol or nitrate of silver, or equal parts of guaiacol or of ichthyol and almond oil, have been claimed as assisting in the same result. It is very doubtful if a peritonsillar inflammation ever has been aborted, but the attempt might be made if the patient chanced to come under observation in the first eighteen hours. After the third day any such effort would be perfectly useless.

In such a painful and exhausting complaint the patient should be put to bed and carefully nursed. The first and most important step in treatment is to secure a thorough evacuation of the bowels. This is best obtained by a dose of calomel. Two to six grains may be placed on the tongue with a little powdered sugar, and washed down with 2 ounces of mist. sennæ co., or decoct. aloes co., or some warm aperient mineral water. Salicylate of soda, salol, or other remedies mentioned under Acute Tonsillitis (p. 372) give some relief. (Formulæ 48, 53, and 59, p. 809.) A hypodermic injection of morphia is often called for at night. Locally, considerable comfort is obtained by a large light poultice, or hot fomentation, or pad of cotton-wool placed beneath the angle of the jaw on the affected side and firmly secured over the top of the head. Ice is to be avoided. It is useless to prescribe gargles, sprays, or paints. The patient cannot use them in the majority of cases; if he does succeed, at the cost of much distress, they do no good. The mouth and fauces are best cleansed, and some relief secured, by syringing the tonsillar region with copious, tepid, alkaline lotions (cf. p. 60, and Formulæ 28, 29, and 32, p. 805). If lotions are too warm they increase the pain. The thick, ropy mucus which is so apt to clog the mouth, is best relieved by

* M. R. Ward, *Trans. Amer. Laryngol. Assoc.*, 1899, p. 60.

Jacques and Lucien, *Ann. des Mal. de l'Oreille*, xxxiv., ii., 1908, No. 12, p. 655.

† Amblard, *Gaz. des Hôp.*, 21 Aug., 1906, p. 1119.

warm saturated solution of bicarbonate of soda. Puncturing the tonsil on the inflamed surface with the object of local blood-letting is of doubtful benefit, and simply alarms the patient.

Certain relief is only obtained by opening the abscess, and

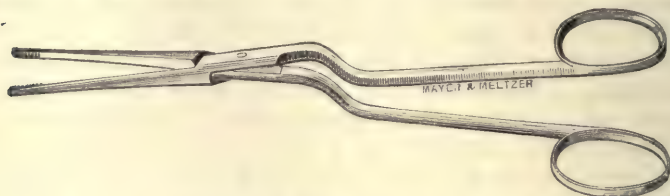


Fig. 216.—Bayonet-shaped, straight, sinus forceps.
Used for opening peritonsillar abscess.

there should be no hesitation in this in view of the painful and debilitating nature of the disease, the risks of secondary infection, and the possibility of death from hæmorrhage or the spontaneous bursting of the abscess. It can be done with a pair of sinus

forceps (Fig. 216). The inflamed area is sprayed with cocaine and adrenalin, the patient's head supported, and the field of operation well illuminated. The abscess cavity will nearly always be found above and external to the tonsil, about the middle of a line drawn from the base of the uvula to the last upper molar tooth on the affected side.* Another scheme for locating the purulent collection is the following: If an imaginary horizontal line be drawn through the base of the uvula, and another vertical one along the anterior faucial pillar, they will intersect above the tonsil (Fig. 217).

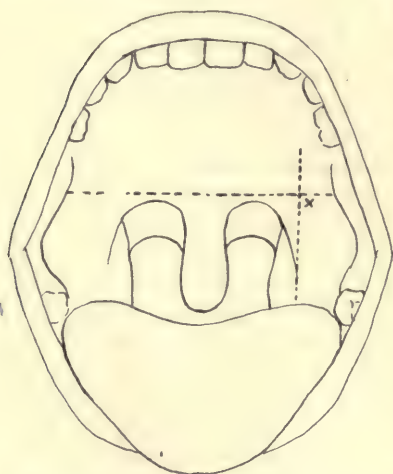


Fig. 217.—Semi-diagrammatic outline to indicate site for opening peritonsillar abscess.

One to two cm. external to this is the best point for opening the abscess. With the point of the forceps the region can be palpated. If it gives a firm, cartilage-like sensation, we should "tap" outwards until a boggy area is felt. With slightly increased

* O. Chiari, *Wien. klin. Woch.*, 1889, No. 43.

pressure the forceps are then pushed backwards and outwards till they enter the abscess, possibly at a depth of 2 cm. As they are withdrawn they should be widely separated, as in Hilton's method, so as to enlarge the opening and give free vent to a dirty-white or yellow creamy pus which pours into the mouth, and often emits a putrid odour. If pus is not at once "struck" with the forceps, it may often be located by a probe or grooved sound introduced through the wound. This method is rarely unsuccessful, and, as it will give vent to pus as early as the third day, and sometimes even within forty-eight hours, it is of great value in curtailing much suffering. It may not give complete relief at once in early cases, but then it at least avoids the acute and prolonged suffering.*

If preferred, the site of election can be incised with a knife. A long, narrow, pointed, sharp scalpel is generally employed, with the edge protected by being sheathed with a strip of sticking-plaster to within half an inch of its extremity. A better plan is to use a very sharp Graefe knife, or Weber's knife used for the lachrymal sac, and then enlarge the opening with forceps.

It has been recommended to approach the abscess through the supratonsillar fossa. I have not found the method very successful, or that patients lend themselves to it readily.

Moure, of Bordeaux, recommends the galvano-cautery, used at a white heat, as being rapid, free from risk of hæmorrhage, anti-septic, leaving an open track behind it, and not more painful than the bistoury.

When the abscess is posterior to the tonsil it should be treated in the way described. In the still rarer forms in which it lies externally to the gland, producing very slight projection into the fauces, but tending to spread towards the neck, it may be reached by thrusting the forceps through the tonsil, or it may have to be approached by an incision through the skin.

In opening a peritonsillar abscess it is dangerous to use any general anæsthetic—even nitrous-oxide or a slight degree of chloroform anæsthesia.†

After-treatment.—The incision requires no particular after-care. Whether the abscess bursts spontaneously or is opened, the warm syringing of the pharynx should be continued, and purgatives and some internal antiseptic treatment may be required to correct the effect of the pus which is inevitably swallowed. If the opening is small and tends to close up, it should be kept dilated with a probe and daily syringed out with a warm alkaline lotion.

* StClair Thomson, *Brit. Med. Journ.*, March 25, 1906.

† Maughan and Low, *ibid.*, March 7, 1907.

Prevention.—To avoid recurrence the general hygiene of the patient may require attention, and as a quinsy is frequently consequent on lacunar tonsillitis, the reader should consult the chapter on that affection (p. 367). The local precautions recommended under the heading of Tonsillitis are applicable in the case of quinsy, and it is even more important to get rid of all unhealthy tonsil-remains or adhesions between them and the faucial pillars. The galvano-cautery should therefore be avoided, and complete enucleation is generally indicated. If the attacks of quinsy are infrequent, or the patient is of an age when they may be expected to disappear, the tonsil-remains should be kept in as healthy a condition as possible by syringing and painting with iodine (Formula 71, p. 813).

CHAPTER XXVII

VINCENT'S ANGINA. MEMBRANOUS SORE THROAT. THRUSH. ANGINA ULCEROSA BENIGNA. KERATOSIS PHARYNGIS

VINCENT'S ANGINA

Synonyms.—*Diphtheroid angina*; *ulcero-membranous tonsillitis*; *chancriform tonsillitis*; *ulcerating lacunar tonsillitis*.

Definition and etiology.—A subacute tonsillitis with slight general symptoms, characterized by ulcerative inflammation, and generally regarded as due to the symbiosis of the *Bacillus fusiformis* and a spirillum (the *Spirochæta denticola*).

The bacillus of Vincent is fusiform, pointed at the ends, and somewhat bulging in the middle. It is distinguished from the Klebs-Löffler bacillus by being broader and longer; its length is 6 to 12 μ . The bacilli are frequently arranged in pairs, or in radiating bundles. They form vacuoles, do not stain with Weigert or Gram, but take up the ordinary basic stains such as fuchsin or methylene blue. The bacillus has very free movement. It can be cultivated on the ordinary media, to which human blood serum or ascitic or hydrocele fluid has been added (Hewlett).

The spirillum (*Spirochæta denticola*) is thin and long, does not stain by Gram, and does not take up fuchsin so readily as the bacillus, has free movements, but no flagellæ. Cover-glass preparations should be spread and stained while fresh. It has only been grown in pure culture under anaerobic conditions.*

Some observers point out that fusiform bacilli and spirilla can be found in any ulcerating affection of the mouth (syphilis, lupus, malignant disease, and gingivitis), and that, although they are constantly present and remarkably predominant in cases of Vincent's angina, it is at present sufficient to suggest that the resistance in this disease is singularly modified in favour of these bacilli and spirochætes, and that the infectivity of the disorder has not yet been proved (M. Letulle).

This form of ulcerating tonsillitis is an uncommon disease and is most frequently met with in debilitated subjects who are overworked

* Muhlens and Hartmann, *Zeitschr. f. Hygiene*, 1906, p. 81.

or in insanitary surroundings. It occurs chiefly in children,* but is not uncommon in hospital residents. It is but feebly contagious.

Symptoms.—The incubation period is said to be six or seven days. The onset of the disease is insidious, and there may be so little complaint of the throat that attention is only directed to it by the accompanying glandular enlargement. The disease is ushered in with headache, malaise, coated tongue, anorexia, and pains in the back. The temperature rarely exceeds 101° F., and may remain normal throughout the case. The glands at the angle of the jaw

are enlarged and tender on the affected side. Discomfort in the throat, fetid breath, and slight dysphagia may be complained of, but the constitutional symptoms are not, as a rule, severe. The fetor is generally present and is characteristic.

Examination.—The local features are fairly typical. On the first day one tonsil shows an easily detachable exudation; on the second day this membrane is found to rest on an ulcerated surface; and on the third and fourth days it becomes thicker and softer. The membrane may become detached at its edges, and ex-



Fig. 218.—Vincent's angina.

elled or swallowed, leaving a slightly ulcerated surface, on which new membrane forms. The so-called membrane is, correctly speaking, simply formed by the necrotic tissue from the surface of the ulcer. It is soft, and grey, yellowish-grey, or greenish in colour. When pinched up with forceps it comes away in soft, easily torn fragments, leaving an anfractuous, eroded area dotted with small bleeding points. The ulcer has an irregular, indolent, flattened base, the edges of which are abrupt or sloping (Fig. 218). The surrounding tissue may be reddened and œdematous. After four to ten days the pseudo-membrane ceases to re-form, and the ulcerated surface soon gets clean and heals over. But in more pronounced cases the tissues are involved more deeply, and the process extends over the whole tonsil, the adjoining faucial pillars,

* J. A. Mulholland, "Vincent's Angina in Children," *Laryngoscope*, xxii., 1912, No. 12, p. 1356.

the gums, and, rarely, the side of the pharynx. The destruction of tissue occurs three to four days after the onset of the disease. The surface involved may separate, leaving a deep excavation which heals up with slight cicatricial contraction, but the uvula and more or less of the faucial pillars may be destroyed.* In the great majority of cases Vincent's angina is a unilateral affection.

It is very rare for the disease to invade the larynx† and trachea, or to prove fatal.‡

Diagnosis.—Vincent's angina can readily be confused with diphtheria or tertiary syphilis. From the former it is distinguished by the milder constitutional symptoms, the limitation to one side, and the bacterioscopic examination. From syphilis the differentiation is more difficult, as both fusiform bacilli and spirilla may be found in a cover-glass preparation from a tertiary ulcer, and also because, apart from concomitant syphilis, the Wassermann reaction may be positive. In more than one case I have seen a suspected Vincent's angina reveal its true nature by the evolution of a coppery rash, or other specific stigmata.

Duration.—Most cases recover in seven to fourteen days, but they may relapse, and the condition has been known to persist for more than two months.

Prognosis.—Recovery is the rule, and complications in the glands, kidneys, or serous membranes are unknown (M. Letulle). Yet cases have been known to end fatally by extension to the larynx and lungs (Bruce), or by hæmorrhage.§

Treatment.—Vincent recommends that the ulcerating surface be painted once or twice a day with pure tincture of iodine. It may first require cleansing with peroxide of hydrogen (5–10 vols. per cent.). If the ulceration continues to advance, powdered methylene blue may be applied on two successive days (J. D. Rolleston). Direct application of salvarsan powder on a throat-swab moistened with glycerine, or intravenous or intramuscular injection of the drug, have their supporters and might be employed in obstinate cases.|| Cleansing and disinfection of the mouth will be required, and rest, fresh air, and tonic treatment are important.

* J. D. Rolleston, *Brit. Journ. of Children's Dis.*, July, 1912, ix., p. 311.

† Reiche, *Munch. med. Woch.*, 1907, No. 17.

H. Arrowsmith, *Laryngoscope*, xx., 1910, No. 11, p. 1093.

‡ H. W. Bruce, *Lancet*, Oct. 12, 1907.

§ V. Delsaux, *Presse Oto-laryngol. Belge*, 1913, xii., p. 145.

|| Gerber, *Arch. f. Laryngol.*, 1911, xxiv., p. 367.

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MEMBRANOUS SORE THROAT (NOT DIPHTHERITIC)

Etiology.—A false membrane in the pharynx, particularly in children, is caused by the diphtheria bacillus in the great majority of instances. All cases should be viewed with this suspicion in mind.

A non-diphtheritic membranous sore throat may be due to infection by streptococci, staphylococci, the pneumococcus, *Bacillus coli communis*, or Friedländer's bacillus.* It is chiefly met with in scarlatina and measles, but may be secondary to smallpox, or brought about by traumatism, contagion, poor health, or the causes of other inflammations in this region.

Symptoms.—Rigors, fever, dysphagia, adenitis, and fetor of the breath will draw attention to exudation on the tonsils, fauces, soft palate, and pharynx. If the false membrane is removed, the mucous membrane below is red, inflamed, and not ulcerated. If it recurs it is not so thick and extensive.

Progress is rapid and severe in small children, in whom it may prove fatal in twenty-four to forty-eight hours. Generally improvement sets in within a week.

Complications.—Retropharyngeal abscess may occur, as well as the septic infections which may arise in any throat case—

* F. Semon, *Brit. Med. Journ.*, June 26, 1909, p. 1525.

John Elliott, *ibid.*, p. 1528.

E. Mayer, *Laryngoscope*, Aug, 1900, p. 121.

nephritis, pericarditis, peritonitis, affections of joints, and other pyæmic conditions.

Diagnosis is made from the appearances and the absence of the Klebs-Löffler bacillus.

Treatment.—The pharynx should receive the local treatment recommended in cases of diphtheria (p. 730). The general treatment will depend on the symptoms and the nature of the original cause.

THRUSH

The "white patches" produced by the growth of the *Oidium albicans* in the soft palate and fauces sometimes cause a quite unnecessary alarm by suggesting the possibilities of membranous sore throat or diphtheria. But the patches produced by this fungus are generally of milky whiteness, discrete, slightly raised, without any hyperæmic areola, and also are frequently found on the tongue and the mucous membrane of the mouth (Plate XIII., Fig. 1, facing p. 358). Thrush is most usually met with in poorly-fed and ill-tended children, where the milk supply is not carefully looked after, but it also occurs in adults who are cachectic or in indifferent health. The symptoms are simply local discomfort and slight dysphagia. Microscopical examination of a fragment, and a negative culture, will confirm the diagnosis. Some simple alkaline application—glycerin and boric acid, or borax and honey—will speedily clear up the condition (Formula 73).

ANGINA ULCEROSA BENIGNA

In this rare affection there is a solitary superficial ulceration on the upper part of one of the faucial pillars. It is shallow, with sharp edges, greyish in colour, but without any inflammatory areola. The neighbourhood may be normal, or slightly red and swollen. The ulcer causes little trouble beyond local discomfort and slight dysphagia, but it is of interest as it might be confused with a mucous patch.

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KERATOSIS PHARYNGIS

Synonyms.—*Pharyngomycosis leptothricia*; *hyperkeratosis lacunaris* (Siebenmann); *mycosis tonsillaris benigna* (B. Fränkel).

Definition.—Discrete, horny outgrowths of cornified epithelial cells, generally limited to Waldeyer's ring, producing insignificant local symptoms, and of variable duration.

Etiology.—Keratosi pharyngis commonly occurs between the ages of 15 and 40, but has been met with at 66, and is said to be more frequent in females.

Pathology.—Small projections are seen to originate from the crypts and surface of the palatine tonsils. They are grey, milky-white, yellowish, or chalk-like outgrowths. Some of them may be flat, filling up the crypt, like a millet-seed; others may be yellowish plaques, like a diphtheritic patch; but the characteristic appearance is that of sickle-shaped, horny stalactites (Fig. 219). In

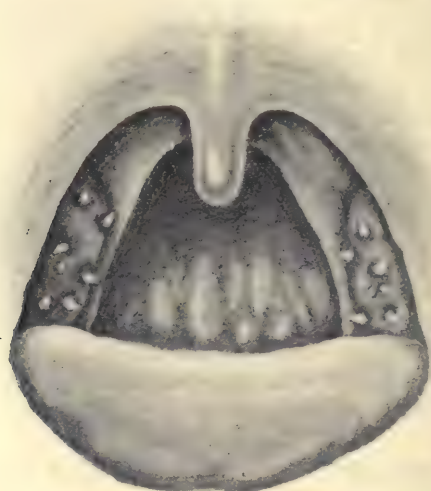


Fig. 219.—Keratosi pharyngis.

addition to appearing on the tonsils, these growths are frequently found on the lingual tonsils, the naso-pharyngeal tonsil (i.e. adenoids), and on any lymphatic masses found on the posterior pharyngeal wall in cases of granular pharyngitis. The projections do not tend to coalesce. The mucous membrane around and between them is not altered. On attempted removal, the horny mass will break off as a soft, cheesy concretion, but the base is so adherent that it cannot be separated without a vigorous scrape, which brings away some of the epithelium and leaves a bleeding surface. The growth readily re-forms.

Under the microscope, the removed mass is found to consist of a granular material, with numerous leptothrix filaments, while the central part is made up of closely packed cornified epithelial cells. The abundance of the leptothrix fungus led observers to regard this saprophyte as the cause, and to consider the affection

a mycosis. But the leptothrix and its spores are almost constantly present in the mouth, chiefly in concretions of tartar, and in the crypts of the tonsil. The excrescences are now regarded as due to an excessive cornification of the lacunar epithelium. The cause of this is not positively known, except that it appears to be met with more commonly in patients who are depressed, worried, or in low general health.

The duration of the condition is very variable. It may disappear in a few weeks, or recur, or persist for months or even years.

Five cases of keratosis laryngis have been recorded by Logan Turner and others.* The vocal cords, and sometimes the adjoining ventricular bands, presented an irregular mammillary or spiculated appearance. The colour varied from snow-white to greenish-white. In these cases the mucosa of the larynx was reddened, and there was pain and hoarseness.

Symptoms.—Keratosis pharyngis is frequently discovered quite accidentally. Some patients complain of local uneasiness, irritation, soreness, dryness, or cough. There are no general symptoms. But, until the diagnosis is made, they are apt to be alarmed at a condition which they are easily able to inspect for themselves. They can be assured that it is unconnected with defective drains or other insanitary surroundings. It has a slow evolution, and may disappear spontaneously.

Diagnosis.—The affection is frequently mistaken for chronic lacunar tonsillitis, but in the latter the cheesy collections are yellowish-white, amorphous, and easily extruded from the crypts. In keratosis some horny projections can nearly always be seen on the lingual and pharyngeal, as well as on the palatine tonsils. From diphtheria it is readily distinguished by the absence of fever, of enlarged glands, of general symptoms, or of the Klebs-Löffler bacillus.

Treatment.—This must be directed to the general health, and a relaxation of work or change of air will sometimes be followed by spontaneous recovery. In some cases the horny growths evidently cause not only anxiety, but much local discomfort, as patients are able to tell from their sensations if all the points have not been removed or if there is any recurrence.

The ordinary antiseptic or astringent applications are useless. Chromic acid fused on a probe, chloride of zinc, and salicylic acid may all fail to eradicate the growths. Such measures may come in

* O. Chiari, *Prag. med. Woch.*, March 1, 1895.

Price Brown, *Canadian Practitioner*, July, 1897, p. 482.

Logan Turner, *Edin. Med. Journ.*, April, 1906, p. 344.

usefully after the masses have been well scraped away with a curette, and their site of origin treated with the galvano-cautery.

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CHAPTER XXVIII

DISEASES OF THE LINGUAL TONSIL

THE fourth tonsil in Waldeyer's ring (Fig. 7, p. 9) is situated at the base of the tongue, on each side of the middle line, behind the circumvallate papillæ, and in front of the epiglottis. It shares in acute inflammations of the adenoid tissue of this region, and is subject to the same diseases as the palatine or naso-pharyngeal tonsils. As the lingual tonsil is more marked in middle life (18 to 40), and is less apt to be affected with chronic hypertrophy, its diseases are comparatively uncommon, and are frequently overshadowed by more visible and better-known troubles higher up. It may be attacked by syphilis, innocent and malignant growths, lupus, and keratosis. Papilloma and other innocent growths are very rare here. Mixed tumours, formed of fibrous, lipomatous, myxomatous, and even cartilaginous elements, may be met with.

Cysts may occur in the form of globular, smooth, tense, yellowish tumours, owing to glandular occlusion. Or the foramen cæcum may be obstructed and the duct dilate into a cyst, lined with ciliated epithelium, and as large as a small hazel-nut. The contents are mucoid. Very few cases have been recorded.

Angioma at the base of the tongue is not so rare. It is congenital, and is really a form of telangiectasis, and associated with similar tumours in the neighbourhood. It should be left alone, if possible. If removal is necessary, it is best done by electrolysis. (Plate xvi., Fig. 5, facing p. 500.)

The veins coursing over the lingual tonsils are sometimes discovered—quite unexpectedly—to be large and prominent. The terms "lingual varix" and "varicose veins at the base of the tongue" were given to a condition which was thought to depend on vaso-motor or vascular deficiency, and to be answerable for many throat symptoms—cough, local discomfort, dysphagia, and pharyngeal tenesmus. It is very doubtful if the appearances are not quite consistent with normal conditions. The symptoms attributable to them are rather due to a neurosis. The only consequence they might lead to would be some oozing of blood,

but it is only slight and never serious. In any case, these veins rarely call for local treatment, and should never be touched until general treatment and mild local measures are exhausted.

CHRONIC LINGUAL TONSILLITIS

The lingual tonsil may undergo chronic hypertrophy, and be sufficiently prominent to be visible even by direct inspection, aided only by a tongue-depressor.

Symptoms.—There are local symptoms of discomfort, irritation, catarrh, hawking, sensation of a foreign body, unnecessary swallowing movements, cough, and interference with the voice. The size of the hypertrophy bears no proportion to the symptoms, of which many are neuropathic.

Examination.—The hypertrophy may be unilateral or bilateral. The enlargement of the lingual tonsil may touch, or more or less conceal the epiglottis, or it may extend outwards towards the anterior pillar until it becomes continuous with the palatine tonsil. The condition generally remains stationary, with occasional exacerbations. The enlargement usually disappears with age, but decided hypertrophies have been found in men of 60 (Moure).

Pathology.—The researches of Swain and Brindel show a complete resemblance to the changes found in the buccal tonsils.

Treatment.—Care of the teeth and gums, regulation of the diet, moderation or abstinence in tobacco and alcohol, and attention to indigestion and constipation, will frequently relieve all symptoms. If the lingual tonsils still continue to cause irritation, they should be cleansed with an alkaline spray (Formula 9), followed by a carbolic, menthol, krameria, or other antiseptic or astringent lozenge. They may require a resorcin pigment (Formula 72), or painting with Mandl's solution (Formula 71), chloride of zinc (gr. x to ʒi), nitrate of silver (gr. xx to ʒi), or sulphate of copper. If this treatment is not successful, the enlarged gland might be reduced with the galvano-cautery, or removed with punch-forceps or a lingual tonsillotome.

ACUTE LINGUAL TONSILLITIS. ABSCESS OF THE LINGUAL TONSIL. LINGUAL QUINSY

Etiology.—Acute inflammation of the lingual tonsil may be produced by the same causes which are productive of ordinary tonsillitis (cf. p. 367). In addition, erosion from a foreign body and the galvano-cautery have been regarded as etiological factors when the base of the tongue is concerned.

Symptoms.—These are very similar. One-sided dysphagia is the

most striking, but, in addition, there may be rigors, headache, fever, a furred tongue, trismus, and salivation. The voice is very thick and woolly, and articulation is indistinct on account of the swelling at the root of the tongue, which is protruded with great difficulty. Later on the voice becomes more "choked." Difficulty of respiration, even requiring tracheotomy, may be caused by oedema of the larynx.

Examination.—The mouth can be opened a little better than in cases of ordinary quinsy, sufficient to show that there is no peritonsillar abscess and nothing beyond a very furred tongue which is painful on being depressed, and much frothy catarrh.

The glands below the jaw may be slightly or markedly enlarged, and in either case are very tender, and so they direct attention to the base of the tongue. Here the laryngeal mirror will show that the lingual tonsil is swollen and red, and later on yellow and oedematous-looking. Fluctuation is made out with difficulty.

Progress.—These cases run a similar course to affections of the palatine tonsils.

Complications.—Edema of the epiglottis and sublingual infiltrations may supervene, in addition to the possibilities mentioned in ordinary tonsillitis.

Diagnosis.—The disease is distinguished from Ludwig's angina (p. 443) by the absence of brawny infiltration of the floor of the mouth, and by the slighter toxæmia.

Treatment.—This is precisely similar to that for ordinary tonsillitis (p. 372). A lingual quinsy can be opened under cocaine with a guarded laryngeal knife, with a stout but pointed probe, and sometimes by simple pressure with the forefinger. It is rarely that an external opening is required, or a tracheotomy called for.

CHRONIC ABSCESS OF THE LINGUAL TONSIL

This is rare and has only been observed by a few (Moure). It is a question if the pus comes from an adenitis, from a suppurating cyst, or from the thyro-lingual duct.

LINGUAL GOITRE

Synonym.—*Thyroid tumour at the base of the tongue.*

A growth of thyroid tissue is not altogether rare in the neighbourhood of the lingual tonsil. It develops from the thyro-glossal duct (Fig. 302, p. 756). Women are more subject to it than men, and between the ages of 15 and 30.* The growth develops slowly;

* Curtis and Gaudier, *Rev. Heb. de Laryngol.*, 12 Avril, 1902, No. 15.

it may be encapsuled or free; and in size it varies from a nut to a Tangerine orange. The symptoms are simply mechanical ones—chiefly of obstruction. The glands are not enlarged.

Removal can generally be effected through the mouth by a wire snare, morcellement, or a lingual guillotine, but the possibility of severe hæmorrhage should be kept in mind. Should an external operation be required, the best is transhyoid pharyngotomy, after a preliminary laryngotomy (cf. p. 773). It is not a bloody operation, and gives free access to the region of the epiglottis and the base of the tongue. The tumour should be enucleated, the operator keeping outside but close to the real capsule of the growth. Before undertaking the operation the presence of the thyroid gland should be carefully determined, otherwise myxœdema might ensue unless a fragment of the lingual goitre were purposely left behind.*

* E. L. Shurly, *Trans. Amer. Laryngol. Assoc.*, xxiv., 1902, p. 85.

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CHAPTER XXIX

PHARYNGITIS.

RETROPHARYNGEAL ABSCESS

ACUTE PHARYNGITIS

Etiology.—This may be considered as (1) predisposing, and (2) exciting, though it is not always possible to separate the two.

1. **Predisposing causes.**—These include any of the debilitated conditions which lower the natural resistance of the individual, especially when occurring in the sedentary or plethoric, and those who spend much of their time in a vitiated atmosphere. Acute pharyngitis is frequently associated with a "bilious attack," and is often met with in drunkards. Any chronic affections of the upper air-passages, and especially those in which there is a chronic secretion of pus—sinusitis, lacunar inflammation of the pharyngeal or palatine tonsils, supratonsillar suppuration, pyorrhœa alveolaris, and chronic nasal stenosis—are predisposing factors. The abuse of alcohol and tobacco conduces to it, and it is said to be more frequent in the gouty, rheumatic, and uric acid diatheses. It is more commonly met with in the winter, spring, or late autumn than in the summer. There appears to be no foundation for the idea that it is more common at the menstrual period.

2. **Exciting causes.**—An "idiopathic" origin is sometimes ascribed to the disease, or else a "chill" is invoked as the exciting cause (*see* p. 101, On 'Taking Cold'). Certain drugs, such as iodide of potassium, mercury, antimony, and arsenic, may sometimes cause it. Acute pharyngitis is not infrequently induced by traumatism, as by the swallowing of hot fluids, corrosives, hot condiments, raw spirits, the inhalation of irritant vapours, and the impaction of foreign bodies. It is met with after operations on the pharynx in which much sponging or traction on the tissues (e.g. morcellement or digital enucleation of the tonsils) has been inevitable. It is sometimes an accidental occurrence in the inexpert removal of foreign bodies or postnasal adenoids.

Acute pharyngitis is often due to the spread of acute inflammation from the nose, the accessory sinuses, the postnasal space, or the larynx. It occurs with such acute infectious diseases as influenza, scarlatina, measles, German measles, smallpox, enteric, and typhus. Erysipelas is frequently given as a cause, but the form produced by this infection will be described separately (*see* p. 443). It is also one of the early manifestations of syphilis, but this will be treated of in Chap. XLV. (*see* p. 655).

Pathology.—The disease presents the usual type of an acute exudative inflammation on a mucous surface, and so offers the stages of congestion, swelling, dryness, increased secretion, and then resolution. The hyperæmia and small-celled infiltration are associated with diminished secretion. This is followed by a free secretion, at first greyish and viscid, and later muco-purulent. The epithelium is shed from a thick velvety surface, and a subacute condition is often left behind.

Symptoms.—Acute pharyngitis is generally ushered in rather suddenly by dryness and discomfort in the throat. The pain varies from a simple feeling of irritation, a desire to hem and hawk, the sensation as of a hair or foreign body, up to that of acute dysphagia when swallowing appears impossible and the mere deglutition of saliva is an agony. There may be a slight chill, with a temperature of 100° to 102°. General malaise and headache are constant. The neck feels sore, and is often held stiffly. If the uvula is affected, the voice becomes nasal, swallowing is more difficult, and ingested fluids may regurgitate through the nostrils. In proportion to the degree of inflammation in the tonsillar region will be the pain and tenderness at the angle of the jaw. The voice is apt to be thick and woolly from the accumulation of mucus in the laryngo-pharynx, though the symptoms of inflammation in the larynx as well as in the nose are often super-added, and the catarrhal process may spread to the Eustachian tubes, giving rise to temporary deafness. The tongue is furred and the breath foul, and there are thirst, anorexia, and constipation.

Examination.—The patient has not the same difficulty in opening the mouth as in acute tonsillitis. With a tongue-depressor the pharynx is seen to be red and swollen, the general lumen of the tube somewhat diminished, and the secretion increased. The colour is generally a deep purple-red, and this, as well as the swelling, may be more marked in some parts than in others. The posterior wall does not always show the most change. The lateral walls are frequently deeply congested, and bulge inwards in rounded folds so as to give the appearance of a second posterior faucial pillar. The fauces, soft palate, and tonsils are frequently implicated, and the uvula may be swollen, rounded, dusky purple, and cedematous-looking, so that it hangs down limply like a semi-translucent sausage. It is this condition which accounts for the patient's complaints of the sensation of a foreign body in the throat, as well as the tickling and cough which are often worse when he lies down. This parietic condition of the uvula and soft palate interferes with the swallowing or expectoration of the thick, tenacious mucus which hangs about.

Diagnosis.—In many cases this will be confirmed by a recognition of the causative factor—infection, traumatism, or extension from neighbouring parts. In many of the acute infectious disorders the acute pharyngitis may precede by three or more days other distinctive symptoms, so that in children the diagnosis and prognosis should be more guarded. In the case of syphilis the true nature of the infection may not be distinguishable until other symptoms develop later. Rheumatism and gout as causative factors should not be overlooked.

Prognosis.—Simple acute pharyngitis is not a serious disorder. Recovery takes place in a few days to a week or two.

Treatment is general and local. The patient should be kept quiet, and, if necessary, in bed. The inflamed region should be undisturbed by smoking, much talking, the taking of alcohol, or of food which is irritating in character or consistence. It is well in most cases to begin the treatment of an attack by the administration of a mercurial purge. Calomel (gr. iii) may be given at night, followed by some mineral water in the morning. Or $\frac{1}{4}$ grain of calomel should be given every half-hour for eight doses in the evening, and followed in eight hours by a dose of effervescing sulphate of soda, seidlitz powder, mistura alba or Rochelle salts. Unless there are indications for some other line of treatment, benefit will be derived from the administration of salicylic acid or some of its salts or congeners. Soda salicylate (gr. x) can be given every two hours until relief is obtained, or salicylic acid (gr. iii) can be ordered every hour until its physiological effects are produced; later on they can be continued with diminishing frequency. Or the same effect can be obtained by salophen or aspirin. If there is much pain or headache, small doses of phenacetin or antipyrin can be added. If these drugs should not agree, and the gouty or rheumatic diathesis be evident, bicarbonate of lithia (gr. x) or benzoate of soda (gr. v-xv) may be used instead; or salicin or colchicum may be indicated. Some practitioners are convinced of the benefit to be obtained by administering tincture of aconite in one-drop doses every fifteen minutes until free perspiration is induced; others are in favour of tincture of belladonna.

As regards local treatment, counter-irritants on the neck are uncalled for, but a warm compress is usually very grateful. Ice should be given to suck, and the patient allowed to drink freely of plain water, Vichy, Ems, barley-water, etc. If there is dryness, an effervescing lozenge of pilocarpin ($\frac{1}{100}$ gr.) may be given every two hours. If the secretion is excessive, a pinch of salt and of bicarbonate of soda (gr. v-xv each) should be added to a tumblerful of hot water and used for drinking, and for washing out the mouth

every two to three hours. The same fluid should be used for syringing out the pharynx frequently (cf. p. 60), or any of the cleansing alkaline lotions recommended on p. 801 may be employed. If the patient objects to the syringing, or is unskilled at it, the same fluids may be sprayed into the pharynx. Cocaine is apt to induce a paræsthesia, which generally adds to the discomfort of the patient by giving the idea of a still greater swelling in the throat. It is better to use menthol, either in the form of lozenges or by adding it to the alkaline lotion employed. Lozenges of *krameria* or red gum are also helpful. If the uvula is very swollen, it can be freely punctured in several places. There should be no suggestion of removing any part of it during an acute attack.

There are few cases of acute pharyngitis in which the postnasal space is not affected. This space, as well as the nasal chambers, will therefore in most cases require systematic clearing of mucus by the use of alkaline lotions. If the larynx or trachea is affected, suitable inhalations must be prescribed.

Convalescence will be assisted by general tonic treatment, and attention to any causative condition will help to prevent recurrence.

CHRONIC PHARYNGITIS

Under this head are included (*a*) simple chronic catarrhal pharyngitis, (*b*) chronic granular pharyngitis, and (*c*) lateral or hypertrophic pharyngitis, as well as the condition known as "clergyman's sore throat."

Definition.—A chronic affection characterized by alteration in the mucous membrane of the pharynx. It particularly involves the muciparous glands, and the lymph-follicles may also be affected.

Etiology.—There are few affections of the upper air-passages which have been made so all-embracing as chronic pharyngitis, both as to its causes and symptoms. Yet probably there is no part of the tract which is less often attacked primarily with chronic catarrh, while no area is more exposed to secondary implication. When persistently inflamed the causes may be obscure, remote, and various.

Recurrent acute attacks may leave a chronic condition of pharyngitis, especially in adults. Exposure to dust and irritating vapours accounts for its greater frequency in those connected with such occupations as cloth-cutting, stone-dressing, and the manufacture of tobacco and cigarettes. Chronic affections of the teeth, mouth, and tonsils are causes which are frequently overlooked, while it is an almost inevitable concomitant of chronic affections and new growths in the pharynx and at the base of the tongue.

Chronic pharyngitis is frequently secondary to various forms of rhinitis and rhino-pharyngitis either by (*a*) direct spread owing to continuity of structure, (*b*) the escape of irritating secretions

into the pharynx, (*c*) repeated efforts to get rid of them, or (*d*) the mouth-breathing induced by nasal obstruction (cf. Mouth-Breathing, p. 92). The flattened epithelium is incapable of freeing itself of deposited matter, except by increased glandular secretion and such abnormal muscular movements as hemming and hawking. This all tends to increase and keep up the chronic inflammatory condition. Pharyngitis often accompanies enlarged tonsils and adenoids, and disappears with their removal. Distinct lymphoid granulations on the posterior pharyngeal wall, in children, are almost inevitably associated with adenoid vegetations in the naso-pharynx (McBride).

Measles and scarlatina are two diseases which are often charged with leaving chronic pharyngeal catarrh in their wake, whilst amongst other exciting or predisposing disorders are chlorosis, anæmia, dyspepsia, constipation, gout, rheumatism, plethora, congestion or cirrhosis of the liver, diabetes, cardiac affections, chronic bronchitis, emphysema, asthma, and tuberculosis.* The pulmonary disorders mentioned excite and maintain a chronic pharyngeal catarrh by the strain of coughing and hawking, as well as by the irritation of the expectorated mucus. In gastro-intestinal affections the pharyngeal mucosa shares in the general catarrh of the alimentary tract, while in all these conditions, and particularly in cardiac lesions, the general circulation is impaired. Tobacco and alcohol, especially spirit-drinking, are common causative agents. In great smokers it is seldom that the pharynx does not show some of the pathological changes to be described, although subjective symptoms may not always be complained of.

The free consumption of condiments is often blamed for inducing this condition, but it is very doubtful if they are ever taken in such excess as to be more than a slight participatory cause.

Improper voice-production is a frequent cause.

The ordinary catarrhal form, as well as granular pharyngitis, occurs most commonly between the ages of 18 and 25. The hypertrophic form is encountered usually between 25 and 50.

Pathology.—Many of the causes enumerated will induce a passive hyperæmia of the pharynx. In all cases there is a slow inflammatory change in the connective-tissue cells of the submucosa, which leads to a permanent hyperplasia of the connective-tissue elements. There is also hypertrophy of all the muscles of the pharynx.† The lymphatic tissue scattered in the submucosa is increased. The granulations of granular pharyngitis are largely made up of masses of lymphoid cells, grouped around the mouths of the ducts of the mucous glands. These form agglomerations varying in size from a split-pea upwards. Sometimes they coalesce into larger, irregular islets. In each granulation the orifice of the gland-cavity may be obstructed, leading to distension and inflammation in the periglandular tissue. The contents of the obstructed gland-cavity sometimes become thickened, and show through the thin mucosa as a white cyst, as in the tonsil. Or the orifice of the gland may rupture and discharge a white, or yellow, or cheesy secretion, forming what has been called "folliculous pharyngitis." The bands seen in lateral pharyngitis are by some considered to be

* J. Garel, "Sur une forme de Pharyngite permettant de reconnaître le Diabète ou l'Albuminurie," *Ann. des Mal. de l'Oreille*, xxi., 1895, No. 2, p. 121.

J. A. Stucky, "Lithemic Naso-Pharyngitis due to Systemic Disturbance," *Journ. Amer. Med. Assoc.*, Oct. 15, 1904.

† Escat, "Traité des Maladies du Pharynx." Paris, 1901.

similar lymphoid collections, by others they are regarded as chiefly formed by hyperplasia of the submucous connective tissue, while some attribute them to muscular hypertrophy in the salpingo-pharyngeal folds.

Symptoms.—There is no necessary connexion between the subjective symptoms of pharyngitis and the pathological changes found. The converse of this statement is equally true, for many individuals may present all the physical signs of pharyngitis and yet be entirely free from discomfort or disturbance. Not only are many ardent smokers quite unaware of their throats until some accidental inspection reveals a well-marked hypertrophic pharyngitis, but I have known some of the best operatic artists who were quite undisturbed by a similar condition. We must also bear in mind that the pharynx is frequently charged with crimes of which it is entirely innocent, partly because many discomforts originating in other parts of the air-tract are referred by patients to this area, and partly because inspection of it is so easy.

The symptoms complained of are very variable, both in character and in intensity. Discomfort in the throat is the most usual one, and is described as a mere consciousness of it, or as being sore, aching, full, or giving the sensation of a hair, lump, or some other foreign body. There is much hemming, hawking, or gagging, which the patient states is to clear the throat, although there is seldom any marked increase in the amount of secretion. There may be a frequent desire to swallow, with some pain in doing so, although there is never real dysphagia. Pain may be referred to the ears. A hacking, rasping, or scraping cough is often super-added—what in some cases is called a “stomach” cough. It may be of the most hollow, resounding, and alarming tone, or it may be a stuffy and ineffectual cough, which gives rise to attacks of laryngeal spasm (cf. p. 545). The voice is often impaired, being hollow and weak, and without resonance, or what teachers describe as “colorito.” This is particularly the case with clergymen and other professional voice-users. They appear to have to speak with much care, frequently pausing to clear the throat or swallow a little mucus. The voice may be bitonal, and is apt to “crack” or drop suddenly to a whisper. Continued attempts at speaking may end in a feeling of cramp or spasm, which the patient instinctively tries to check by grasping his throat with his hand. The local symptoms of chronic laryngitis are frequently present, and dyspeptic complaints are common. The spread of catarrh to the Eustachian tubes may be indicated by a slight and varying deafness.

Examination.—Excessive sensitiveness may be the first point noticeable. The patient is not only unable to bear the pressure

of a spatula on his tongue without violent retching, but even the request to open his mouth may excite efforts at vomiting. The first glance into the pharynx may reveal a general reduction in the lumen of the tube, while the straining efforts of retching may throw into prominence the enlarged lateral bands. Inspection will reveal more or less congestion, the mucosa being dusky red, swollen, and velvety. This congestion is by no means uniform; it may be absent from the posterior wall, but is generally marked in the region of the fauces and the edges of the soft palate. Apart from the general congestion, the veins stand out more prominently than usual. The uvula generally hangs forward inertly, owing to a general thickening which at first is limited to its centre, leaving the borders thin "and translucent like the tail of a tadpole" (Escat). In cases which have advanced to the more markedly hypertrophic form the uvula loses this shape, and more resembles an obtusely-ended sausage (Fig. 195). The palatine tonsils, if present, share in the general catarrh, and those at the base of the tongue will be seen to be congested. Examination of the larynx shows catarrh, possibly some congestion and even succulence of the interarytenoid fold, and some catarrh of the posterior ends of the vocal cords, which, on phonation, may be seen to be somewhat paretic. With the post-rhinoscopic mirror (p. 28) a velvety catarrhal condition of the cavum pharyngeum is seen, and the posterior ends of the inferior turbinates will in some cases be enlarged and coated with clinging mucus. The limit of the catarrhal process will extend upwards and downwards to a variable distance in different cases. The examination should also be directed to any of the possible causes already enumerated (p. 428).

The enlarged bands of pharyngitis hypertrophica lateralis are sometimes so prominent that they form on each side a symmetrical, dull-red, beefy-looking fold behind the posterior faucial pillar. In other cases they are only brought into view by depressing the base of the tongue considerably, perhaps even to the extent of making the patient gag and retch.

The granulations are met with as described. They are chiefly found in young adults, scattered irregularly on the posterior wall.

The condition met with will vary according to the age, occupation, and character of the patient. In all cases a catarrhal condition of the mucosa is the first process. This precedes the development of hypertrophic pharyngitis and of granular pharyngitis. It is therefore met with in combination with either or both of these conditions. Many cases occur which are also advancing towards the stage of pharyngitis sicca, to be shortly described (p. 435), so

that conditions will be encountered in practice in which many of the symptoms are more or less blended.

Diagnosis.—A careful inspection will generally suffice to distinguish this condition, but it must be conducted very carefully and extensively so as to eliminate all the causative conditions of which the pharyngeal catarrh may only be a secondary consequence. This applies particularly to examination of the digestive and pulmonary systems, and care must be taken that some pathological factor in the larynx, or in the nose and its accessory cavities, is not overlooked.

Prognosis.—This will depend to a large extent on the recognition of the cause. As a rule the condition is a tedious one, and although it nearly always improves considerably under treatment, it is apt to last for years, and may pass into the hypertrophic or atrophic forms. The form known as granular pharyngitis is, however, one that can generally be overcome. The subacute form of pharyngitis following measles or influenza may take one or two months to disappear.

Treatment.—The general treatment is often more important than any local measure, and the nose, naso-pharynx, larynx, chest, and abdominal organs will require investigation before any local measure is justifiable. Anæmia and chlorosis demand general hygienic treatment, as well as iron, or arsenic, or aperients. Gout, rheumatism, dyspepsia, constipation, and portal congestion call for appropriate measures. Many cases will be benefited by morning doses of Karlsbad salts, 1 or 2 teaspoonfuls of Epsom salts in hot water, the granular effervescent phosphate or sulphate of soda, or some aperient mineral water. Dyspeptic symptoms must be relieved, and the various alkaline mixtures with vegetable bitters are frequently of more benefit than any topical treatment (*see* Formulæ 56 and 57, p. 810).

In dyspeptic patients, as well as in those who are nervous, rest from work and change of scene and occupation are important measures. The various nervine tonics, especially arsenic, will often be indicated.

In the early or acute stage, where permanent structural change has not taken place, Braden Kyle has obtained good results from the administration of drugs which are eliminated by the mucous membrane. He administers the following three times daily:—

R Phosphori	gr. $\frac{1}{100}$ (0.0006)
Iodini	} āā gr. $\frac{1}{8}-\frac{1}{6}$ (0.008-0.01)
Bromini	
Vini Xerici	fl.3i (4.0)

Misce.

Where the voice is particularly affected it may require resting, and more important still will be lessons in pulmonary exercises, elocution, and voice-production. Spitting should be forbidden,

and the patient can be assured that all unnecessary hawking and hemming only aggravates his trouble.

The avoidance of the various external exciting causes need only be mentioned, and, next to the avoidance of dust, it is well for the patient to abandon entirely the use of alcohol and tobacco.

Local treatment should be kept in reserve, particularly in the form of granular pharyngitis. Occurring, as the affection often does, in neurotic subjects, the directing of the attention to the pharynx by active local treatment is not only uncalled-for but tends to concentrate the patient's interest on his subjective symptoms. Some simple spray and lozenge is often sufficient to satisfy him that, while the real causative condition is being remedied, his local condition is not being overlooked.

Temporary relief can often be obtained by sipping a glass of hot milk containing a pinch of salt. The pharyngeal surface should be frequently cleansed with some alkaline lotion such as salt, or bicarbonate of soda, or borax, or any combination of these in the strength of 5-10 gr. to the ounce (Formulæ, p. 801). A small quantity of white sugar or glycerin may be added to make them palatable, but much of the latter drug should be avoided, as it only dehydrates the mucous membrane. These alkaline lotions may be used as hot as possible, and sprayed or syringed into the pharynx; gargling is very ineffectual. The same lotion will, in many cases, be required for cleansing the nasal chambers or clearing the postnasal space.

Lozenges, particularly of compressed chlorate of potash, chloride of ammonium, or borax, are frequently prescribed, but it is very doubtful if the application of such drugs in concentrated form to a diseased pharynx is desirable, and it certainly cannot improve the digestive system for the stomach to receive 15 to 30 gr. of these salts in undiluted form during the day. All lozenges containing mineral astringents, or made up with a sugar basis, should also be avoided. In rheumatic or gouty cases a lozenge of guaiacum may be prescribed, and irritation or undue sensitiveness can be met with one containing menthol, codeine, or heroin (Formulæ, p. 808). Both morphine and cocaine should be avoided. The pharynx may be painted once or twice a week with a solution of nitrate of silver 2-5 per cent., protargol 2-4 per cent., argyrol 25 per cent., sulphate of copper 10-20 gr. to the ounce, sulphate of zinc or chloride of zinc 2-5 gr. to the ounce. Protracted use of nitrate of silver should be avoided, from the possibility of producing permanent staining of the skin (argyria). Benefit will frequently be obtained by the topical use of iodine in the form known as pigmentum Mandl, and this has the advantage that it

can be applied by the patient himself, every day if necessary, after an alkaline cleansing of the pharynx (Formula 29).

The centre of the follicle may be punctured or scratched with the tip of a bistoury or sharp-pointed pair of scissors, or it may be touched with a glass rod of which the tip has been just moistened with dilute hydrochloric acid, trichloroacetic acid, or pure carbolic acid. Nitrate of silver or chromic acid fused on a probe, or a 20 per cent. solution of chromic acid on cotton-wool, may be employed. Before making any of these applications the surface should be mopped as dry as possible, to prevent the corrosive action of the caustic from spreading.

Finally, I come to the use of the galvano-cautery, which is too often the first remedy thought of, instead of being the last. Many cures are undoubtedly obtained by it, but it is quite possible that this is to some extent owing (*a*) to the rest to the pharynx and larynx which goes with the treatment, (*b*) to reflex action on the larynx, or (*c*) to the mental impression on the patient. Many of these patients come with the specific request to "have the throat burnt," either because some friend has recommended it, or because they have previously by its means been relieved of a granular pharyngitis, and therefore hold that the galvano-cautery is the remedy for all throat troubles. The cautery is often recommended to "destroy the granulations," and it may do this so effectually that, by destroying the mucous and lymph-glands, a condition of atrophic pharyngitis is induced! Fortunately the reserve of lymphoid tissue is so plentiful that fresh masses generally hypertrophy to replace those destroyed. The galvano-cautery should be used on the same principle as other caustics already mentioned, namely, as a destroyer of diseased tissue, and for its constricting action in producing scar tissue (cf. p. 67). Anyone used to making the application will be able to pass the point into two, three, or four follicles before withdrawing the instrument from the mouth. These applications should only be made at one sitting to part of the granulations—say to those on one side of the middle line—and at least a week to ten days should elapse before the others are similarly treated. In the interval, while the eschar is separating, the patient should continue the use of an alkaline spray, while the pharynx can be soothed and kept clean by a menthol lozenge. A little orthoform powder can be puffed on to the cauterized surface, and the patient advised to avoid exposure to vitiated or septic air, irritating food and drink, as well as tobacco, for a few days. There is no need to remain indoors.

In the class of patients who can afford it, a visit to some health-resort is often very advantageous. The selection of the spa

will depend on the patient's general condition and diathesis, much more than on the pharyngeal conditions. Thus, in the gouty and plethoric a choice may be made between Brides-les-Bains, Karlsbad, Marienbad, Vichy, Homburg, Tarasp, Kissingen; for the rheumatic there are Harrogate, Bath, Strathpeffer, Aix-les-Bains, Wiesbaden. The cases of purely catarrhal pharyngitis are well catered for at the simple saline waters of Ems, or the sulphur waters of Cauterets. The anæmic may be sent to the iron waters of St. Moritz, Spa, Schwalbach, or to the arsenical waters of Bourboule or Mont Dore.

As to preventive measures, reference need only be made to the importance of eliminating the causative factors, training the voice, and establishing hygienic living.

CHRONIC ATROPHIC PHARYNGITIS

Synonyms.—*Dry pharyngitis*; *pharyngitis sicca*; and, in certain cases, *ozænic pharyngitis*.

Definition.—A chronic catarrh of the pharynx resulting in atrophy of the mucous membrane.

Chronic atrophic pharyngitis can seldom occur as a primary affection; it represents the later stage of a catarrhal or hypertrophic pharyngitis, even although the latter may have failed to attract attention. It varies in degree from simple collapse, due to deficient circulation, up to the stage in which all the glands are atrophied and the normal mucosa converted into connective tissue.

Etiology.—The causes may be regarded as primary or secondary, or as local and constitutional. An early stage, for which the name of pharyngitis sicca is more suitable, may occur without atrophy. In this the dryness of the mucous membrane is simply due to the defective or perverted glandular secretion met with in various constitutional disorders. Hence the glazed condition of pharynx sometimes seen in diabetes, Bright's disease, and gastro-intestinal disorders. A similar condition may be due to the impaired secretion of old age. In anæmia it is due both to impaired secretion and to diminished vascularity in the part. More commonly it is secondary to atrophic naso-pharyngitis, atrophic rhinitis, or other purulent process in the nose and cavum pharyngeum. Consequently it is apt to follow on empyema in any of the accessory sinuses, and on syphilis or lupus in the nose or postnasal space. It is found in some children with adenoid growths. In such cases it may be brought about by (a) continuity, (b) the discharge of pus and crusts into the pharynx, or (c) the mouth-breathing induced. The latter factor is also effective in those cases in which it has been found necessary to remove a large amount of the turbinals on one side, e.g. for malignant disease of the nose. Some cases have followed on a too complete turbinotomy (p. 138).

Pathology.—The first change is in the glands. The secretion becomes thick and dries on the surface like shellac, thus producing

a chronic inflammation of the submucosa. This inflammatory process tends to organize and contract, so pressing on the glands and vessels, and arresting secretion and nutrition. More scar-tissue and atrophy are thus produced, and the result remains permanently.

Symptoms.—The chief complaint is of dryness in the throat. In mild cases this may only be enough to excite attempts at relief by hemming, swallowing a little saliva, or taking a few sips of water. In more marked cases it induces distressing attempts at clearing and moistening the throat. These are worst in the morning, when the efforts to disengage the dried mucus or scabs from the pharynx may induce retching and vomiting and considerable exhaustion. Relief may have to be sought by clearing the back of the throat with the finger-nail, or with a brush or spoon. Talking only induces further dryness, so that the patient is apt to avoid conversation and become solitary and miserable. In many cases hoarseness and cough are also present owing to the spread of the condition downwards, or to a laryngo-tracheitis produced by the same causes which have started the atrophic pharyngitis. The fetor which sometimes accompanies the disease is generally due to the concomitant affection of the nose, although the crusts from the pharynx may themselves be very foul.

Examination.—The condition of the pharynx will vary according to the stage of the disease. In all cases the lumen of the tube will seem larger than the normal. The pillars of the fauces appear thin, and stand out clearly; the uvula is smaller than usual; and the prominence of the vertebral bodies and discs is visible through the wasted pharyngeal wall. It is well to remember that remains of granular or hypertrophic pharyngitis may be found, so that collections of granules or enlarged lateral bands may be present together with atrophic patches.

In the early stages the mucous surface is only pale, and slightly dry or glistening. When the condition becomes established the surface is coated with dried mucus, as if it had been varnished. When any movement is excited in the pharynx this varnished surface is seen to wrinkle, like a snake's skin, instead of falling into moist folds. If it is consequent on any purulent process, dried scabs will be found adhering closely to the surface. They are separated with difficulty; often leave eroded and even bleeding surfaces; and reveal a mucosa which has evidently lost its epithelial covering.

A similar condition may be met with in the larynx and nasopharynx, and an examination of these regions, as well as of the nose, will probably reveal the source of the whole condition.

Diagnosis.—Atrophic pharyngitis must not be confused with any active syphilitic process in the pharynx. From this it is

distinguished by its more general distribution and the absence of ulceration. The scar-tissue left by healed syphilis, scarlatina, or lupus is also associated with atrophy of some part of the pharynx.

Symptoms of dry pharyngitis should always suggest a careful exploration of the naso-pharynx, nose, and accessory cavities. In adults it would recall the possibility of diabetes, albuminuria, or other general affection.

Prognosis.—This is good, if the cause can be traced to some nasal origin—say, an empyema in one of the accessory cavities, or a syphilitic sequestrum—or to some curable general condition, such as anæmia. If the nasal cause is obscure or incurable, much relief can still be secured for the pharynx by general measures of cleanliness and disinfection applied to the nose.

Treatment.—This should be directed to the primary cause, which, as already stated, will be found in the nose in the majority of cases. The pharynx should be kept clean by spraying or syringing with warm alkaline lotions. If the crusts are not easily detached they may be loosened by equal parts of peroxide of hydrogen and aqua menthæ piperitæ. When the crusts extend beyond the reach of the spray they can be softened by vapor creosoti. This toilette of the pharynx is carried out two or three times a day, and on each occasion an application of equal parts of lanolin and ichthyol should be made to the exposed surface, or paroline might be freely sprayed through the mouth and also through the nose. (Formulæ 66 to 69, pp. 812-13.) This helps to lubricate the mucosa and prevent the adhesion of dried mucus. The paroline may be rendered more antiseptic and pleasant by the addition of menthol, oil of wintergreen, thymol, or eucalyptus, but it is well to remember that all of these are slightly irritating, and that it may not be wise unduly to stimulate a permanently atrophic tissue. Painting with refined, or even crude, petroleum twice a day has been recommended. It may require to be continued for six to ten months, and almost permanent relief has been obtained in apparently almost hopeless cases.* The iodine and glycerin paint is also useful (Formula 71). Such a course of treatment is sometimes assisted by the administration of small doses of iodide of potassium, which stimulates secretion and assists the detachment of crusts; but it has no curative action, and should therefore be used only as a measure of temporary relief. (Formulæ 60 and 61, p. 811.)

Massage has many advocates, and in some cases is helpful.

* Braden Kyle, "Diseases of the Nose and Throat," 4th ed., p. 526. London, 1907.

Considerable relief is available for the well-to-do by a visit to any of the sulphur spas, such as Harrogate, Strathpeffer, Aix-les-Bains, Aachen, Cauterets, or Luchon. Any general condition calling for treatment should not be overlooked, for many of these patients are evidently in poor health. The anæmia, dyspepsia, loss of weight and strength, and nervous depression may be due to the distress caused by what they too often realize to be an incurable condition, to their secluded and sedentary lives, or to the absorption of much septic matter. Apart from general directions as to diet and hygiene, many of them are benefited by the administration of some stomachic bitter (Formula 57), or arsenic (Formula 58), or other nerve tonic, or by the iodide of iron (Formula 60).

RETROPHARYNGEAL ABSCESS

Definition.—A collection of pus between the posterior pharyngeal wall and the cervical vertebræ. It occurs in two forms—(1) the acute primary, and (2) the chronic and generally tubercular type. It is a comparatively rare affection clinically, although some observers regard it as much more common than is generally believed, being often overlooked during life, and not uncommonly found unexpectedly post mortem.*

Etiology.—The acute primary is the more frequent and more formidable type. It is met with in infancy between the third month and the third year of life, and more often in male children. It is rare in children over 4, and 75 per cent. of cases occur in the first year of life. It is predisposed to by feeble vitality, defective nourishment, gastro-enteritis, rickets, tuberculosis, inherited syphilis, and bad hygienic conditions. The immediate cause is probably in all cases a septic infection from the nose or pharynx, generally from the tonsils or adenoids which are usually present in these cases. The patient may have previously been healthy and strong, though in some instances an abscess follows acute infectious diseases, such as scarlatina, measles, mumps, diphtheria, erysipelas, or influenza. It is also met with after simple catarrh of the mouth, nose, naso-pharynx, pharynx, tonsils, or middle ear. Less frequently it is secondary to cervical caries, tuberculosis in the cervical glands, suppurative otitis media, and, still more rarely, traumatism. In older patients the infection may start from a sinusitis or any specific fever. The cause is often difficult to trace. The chronic tubercular form is a less frequent type.

Pathology.—The disease consists in a suppurative lymphadenitis of the retropharyngeal glands of Henle, situated on each side of the middle line, between the posterior pharyngeal wall and the aponeurosis over the bodies of the 2nd and 3rd cervical vertebræ (Fig. 200, 4, p. 385). These glands receive the lymphatics of the postnasal space, pharynx, nose, Eustachian tube, and middle ear. They atrophy between the third and fifth year of life, and may even disappear entirely after the

* Thoyer-Rozat, Thèse de Paris, 1896.

seventh year. When infected from the lymphatics, there is first adenitis, then periadenitis and abscess. Induration is apt to escape notice. The suppuration is usually one-sided, and most prominent in the oropharynx. If not evacuated, spontaneously or artificially, the abscess may spread along the œsophagus, or burst in different directions—towards the larynx, the angle of the jaw, or even through the external auditory meatus. The pus is generally fetid, uniform, yellowish, and sometimes dirty-looking. It may contain streptococci, staphylococci, and pneumococci, but there is no specific organism.

The chronic form of retropharyngeal abscess is almost always dependent upon tubercular disease of the bodies of the cervical vertebræ, and so comes under the notice of surgeons when treating cases of "Pott's disease." In rare instances it may be due to "cold abscess" arising in connexion with the prevertebral glands, unassociated with vertebral caries. It has also been found associated with syphilis of the mouth and pharynx.*

Symptoms.—The age of the patient renders the history and the commencement of the illness obscure. It may be ushered in by a simple catarrh, a syphilitic coryza, or some zymotic complaint such as measles. The onset may be acute; the temperature is usually 102° to 104° F., and an abscess may develop in two or three days. But an abscess may form without fever or pain, and the pus may collect so slowly that two or three weeks may elapse before the symptoms are manifest. There is evident dysphagia. Respiration is slow and painful, with inspiratory stridor. Snoring may be present, and continue even when the nostrils are closed.† The child refuses the bottle, or food is regurgitated. There are dyspnoea, restlessness, and a cough suggestive of "croup." When the abscess is large the child's cry has been compared to the "quacking of a duck." The mouth drops open and the head is held stiffly, and possibly to one side. The glands on the side affected may be slightly enlarged, hard, and tender, but not so marked as in cervical adenitis. This latter is rare in infants and generally accompanies tonsillar infection.

With the progress of the case emaciation becomes evident, and cyanosis may give warning of asphyxia. Delirium, convulsions, vomiting, and constipation may occur. The child looks seriously ill and is restless, perspiring, pale or cyanosed, with open and dribbling mouth. Breathing becomes more rapid and difficult on lying down. A purulent nasal discharge is often present.

Examination.—Examination will show a rounded swelling, pushing forwards below the soft palate and impinging on the laryngo-pharynx (Fig. 220). It is usually lateral in position, and seldom central. There is little evidence about it of inflammation.

* P. Mermet, *Gaz. des Hôp.*, 12 Mars, 1895, No. 31, p. 297.

† Marfan, *Bull. Méd.*, 1889, No. 102.

Inspection is generally insufficient, and palpation will better reveal the local condition and detect fluctuation. If the swelling is low down it produces marked œdema of the ary-epiglottic folds.

Diagnosis.—When, in the first half-year of life, an infant ceases to suck well, chokes, coughs, and is restless in sleep, we should always think of a retropharyngeal abscess.* Probably no acute illness of childhood is more frequently overlooked, and this will



Fig. 220.—Retropharyngeal abscess.

Section through the cervical vertebrae, pharynx, and adjacent parts of a boy aged 2½, showing the cavity of a retropharyngeal abscess. The abscess extends from the level of the basi-occipital above, to that of the 5th cervical vertebra below; the swelling is greatest opposite the body of the 3rd cervical vertebra. The abscess cavity is lined by a brownish membrane; the posterior pharyngeal wall, which forms the anterior boundary of the cavity, appears thickened. The way in which pressure has been exercised on the upper opening of the larynx is well illustrated. There is no evidence of spinal caries, nor anything to explain the cause of the abscess. (*St. Bartholomew's Hosp. Mus., No. 1841a.*)

continue until the rule is established of palpating the pharynx in all cases in infants where respiration or deglutition is affected.†

From laryngitis, bronchitis, and diphtheria the condition is distinguished by the fixation of the head, the unilaterally enlarged

* Moritz Schmidt, "Die Krankheiten der oberen Luftwege," vierte Auflage, p. 214.

† H. I. Pinches, *Brit. Med. Journ.*, Sept. 28, 1907:

glands, the dysphagia, and by the appearances on examination. A solid growth, such as a sarcoma, yields no fluctuation, is irregular or nodular, and there is no rigidity. When the dyspnoea is the dominant symptom, the case may be mistaken for a foreign body, laryngitis, diphtheria, inflamed adenoids, broncho-pneumonia, scarlatina, or even meningitis. From cervical caries or Pott's disease it is distinguished by the fact that caries is extremely rare in infants, starts insidiously, progresses slowly, and is unaccompanied by fever. The child's head, in disease of the spine, is held in a characteristic pose, and there are violent pains, especially at night. In adults a gumma might be mistaken for the condition.

Prognosis.—The disease is serious and, when not diagnosed, almost inevitably ends in death. Before the abscess bursts, death may result from spasm of the glottis, laryngeal oedema, asphyxia, or cardiac failure from pressure on the vagus or sympathetic. The affection runs its course in five to ten days, and, if the abscess bursts spontaneously, death often results either from suffocation or from septic pneumonia. If the abscess is opened in good time the prospect is good, as the patient is at once relieved, and begins to recover rapidly, unless there is vertebral caries. In adults the prognosis should be more guarded. If the diagnosis is uncertain we may administer an aperient, order warm compresses and hot inhalations, and treat any catarrh of the air-passages. Death may occur, even after successful operation, from sloughing of the internal carotid.*

Treatment.—Once the diagnosis is established we must intervene in all cases, and not wait for distinct fluctuation. The evacuation of the abscess through the mouth was formerly looked upon as full of danger, owing to the risk of the larynx being flooded with pus, and the more difficult plan of opening the cavity from the neck was generally recommended. It is a relief to be assured that "the majority of cases can be opened through the mouth with perfect safety" (Coakley). No general or local anæsthetic should be administered, but everything required for an immediate tracheotomy (p. 775), or intubation (p. 768), should be ready at hand in case of need. The infant is swaddled in a shawl so as completely to control the movements of the extremities, and is then laid on its side, without a pillow, and held by a trustworthy assistant, with the head low and the face directed somewhat downwards. The sinus forceps recommended for opening peritonsillar abscesses (Fig. 216, p. 410), or a guarded scalpel, is then thrust into the most prominent part of the swelling, and the opening enlarged in the long axis of the body. The pus will pour out through the nose and

* Andrew Wylie and Wyatt Wingrave, *Lancet*, April 14, 1906, i., p. 1042.

mouth. The practitioner may feel more security if, with the same precautions and with the patient in the same position, he first aspirates the pus cavity. The after-care of the patient will require consideration, since the disease is generally met with in the feeble and ill-nourished.

When the abscess points towards the neck, it must be opened through an external incision. This is made along the posterior border of the sterno-mastoid muscle, and the dissection is carried behind the large vessels of the neck and in front of the prevertebral muscles. The external operation, which leaves a certain scar, is reserved for some rare cases, such as those where the abscess is too low to be easily reached through the mouth, when spasm of the masseters cannot be overcome, when a large pulsating vessel is noticed in front of the abscess, or when the abscess is more lateral than central.

No gag should be employed, a tongue-depressor or the operator's left forefinger being sufficient both to keep the mouth open and to act as a guide.

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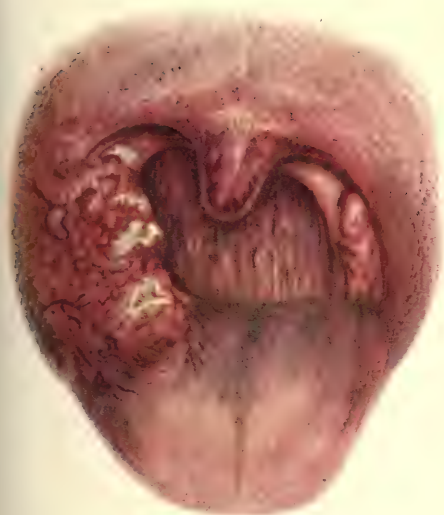


Fig. 1.—Pharyngeal herpes. The picture presents the three stages of herpes formation—vesicles, ulcers, and membranous exudation. (See p. 739.)

Fig. 2.—Carcinoma of the tonsil, in a man aged 48. (See p. 455.)

Fig. 3.—Carcinoma of the naso-pharynx. (See p. 354.)

(From Grünwald's "Atlas and Ebitome of Diseases of the Mouth, Pharynx, and Nose.")

CHAPTER XXX

ACUTE SEPTIC INFLAMMATION OF THE THROAT. PHLEGMONOUS INFLAMMATION OF THE EPIGLOTTIS. GANGRENE OF THE TONSILS

ACUTE SEPTIC INFLAMMATION OF THE THROAT

Synonyms.—This section includes *acute septic pharyngitis and laryngitis*; *laryngeal phlegmon*; *hospital sore throat*; *acute œdema of the pharynx and larynx*; *phlegmon and erysipelas of the throat*; *Ludwig's angina* (angina Ludovici); *submaxillary cellulitis*; and *acute cellulitis of the neck*.

Introduction.—Many other affections of this region, which are now recognized as of septic origin, might be included under the above title, but its adoption helps to a classification and study of various ill-defined conditions. It has been employed since Semon pointed out that several forms of acute septic inflammation in this region may be considered as only degrees of virulence of the same pathological process. It is impossible to unify them on an etiological basis, for it is found that various clinical conditions are anatomically similar but bacteriologically distinct.*

These affections are, fortunately, relatively rare. They are chiefly characterized by their rapid, sometimes deceptive, and frequently fatal course.

Etiology.—Adults are generally attacked, but no age or sex is exempt. Septic inflammation is commonly met with in alcoholic subjects, and in those who are broken down in health by want or privation, but it is also found in the well-to-do, the temperate, and the apparently robust.

The *Streptococcus pyogenes* is the organism most often associated with these acute septic inflammations.† But clinical evidence shows that identical pathological conditions may be produced by *Staphylococcus pyogenes*, *Bacillus pyocyaneus*, *B. coli communis*, and *Micrococcus tenuis*. Entrance to the submucous tissues of the throat apparently takes place through some fissure in the mucosa,

* F. Semon, *Med.-Chir. Trans.*, lxxviii., 1895, p. 181.

† De Santi, *ibid.*, lxxxvi., 1903, p. 303.

or even through intact epithelium. In some cases of angina Ludovici, infection has apparently reached the submaxillary region through a carious tooth. It may extend from the glands in acute exanthemata—chiefly scarlatina and measles—and it has been attributed to traumatism. At times it has appeared to be epidemic. Uncooked milk has been suspected of conveying it.*

Pathology.—This varies very much with the location of the affection, the depth to which it has travelled, and the virulence of the process. The surface changes may be slight, and yet the inflammation may have extended through the submucous tissues, enveloping the entrance of the larynx, extending along the trachea and œsophagus, burrowing below the cervical fascia in the neck, and spreading to the lungs. It is impossible to separate the purely local from the more diffuse infiltrations, or the simply serous exudate from that which is purulent or even gangrenous. The affection may be limited to the pharynx, but it tends to spread to the larynx, and, less commonly, to the naso-pharynx. On the other hand, the larynx may show very marked œdema and the pharynx be but slightly affected. No characteristic change is found in the nose, but, as the infection of facial erysipelas very frequently starts from the nares, it is possible that the disease under consideration may also be inoculated there.

Symptoms.—These depend upon the type, for we are now studying in one group the hospital sore throat, which may run a mild course of several days, and the acute septic infection, which may cause death in twelve hours. It has been suggested that five degrees of septic inflammation may be recognized clinically (Watson Williams)—(1) *superficial septic inflammation*, e.g. the so-called hospital sore throat; (2) *membranous septic inflammation*, e.g. some cases of pseudo-diphtheria and scarlatinal diphtheria; (3) *œdematous inflammation*, e.g. acute œdematous tonsillitis, uvulitis, pharyngitis, epiglottiditis, arytenoiditis, and cellulitis of the tissues of the neck; (4) *phlegmonous or suppurative cellulitis*; (5) *gangrenous inflammation*.

The invasion may be attended with general malaise, headache, slight feverishness, and some sore throat. Or the onset may be abrupt, being marked by a rigor, with great and sudden prostration, while little complaint may be made of the throat itself. In either case one type may change into the other. The temperature may, even in the acute form, never rise above 99° F., and may remain subnormal. In other cases it rises to 102° or 106°, and chills and rigors are succeeded by profuse perspiration. The pulse at first is full and bounding, but later becomes small, feeble, and

* Gifford Nash, *Lancet*, Oct. 18, 1902.

irregular. Dysphagia, stiffness of the neck, hoarseness, cough, or dyspnoea will be marked according to the development of changes in the pharynx or larynx. The expectoration of a watery or blood-stained sputum may call attention to the onset of oedema of the lungs or pneumonia. Pleurisy, pericarditis, and peritonitis may develop. A general toxæmia and delirium may indicate the supervention of meningitis. In some cases the mind remains quite unaffected, and the patient is quite conscious until death comes by coma or sudden heart-failure.

Examination.—The pharynx is generally found to be acutely congested, of a dark red-blue colour, with the uvula oedematous and swollen. The tonsils may show changes like those in acute follicular tonsillitis, or may present sloughy, evil-smelling patches. In the larynx, the chief manifestations are in the epiglottis and ary-epiglottic folds (Fig. 221). These are acutely swollen and oedematous, the epiglottis being folded on itself in a purplish-red roll, and the two ary-epiglottic folds in contact in the middle line, so that any view of the inside of the larynx may be impossible, the more so as thick mucus hangs about and is difficult of expulsion. (Fig. 229, p. 485.) In slighter

cases only the epiglottis is infiltrated with an oedema-like exudation, and the arytenoids are simply congested (Plate xv., Fig. 2, p. 468).

The tongue may be pushed up by a sublingual swelling. In this type (Ludwig's angina) there is a hard, brawny swelling on the floor of the mouth and below the jaw. It is well defined, does not pit on pressure, and is of wood-like induration. Examination of the neck may reveal a brawny infiltration, and possibly obscure fluctuation. There are rarely metastatic abscesses, and the glands are not markedly affected.



Fig. 221.—Septic laryngitis.

Posterior view of a larynx removed from a woman aged 42 years, who died of so-called angina Ludovici. The oedematous swelling of the mucosa over the epiglottis, of the aryteno-epiglottidean folds, and over the arytenoid and cricoid cartilages, is well shown. The mucous membrane of the pharynx was also swollen. The swelling is so considerable that the entrance to the larynx is generally narrowed.

Bacteriologically, pneumococci were found locally in the neck and larynx, and also in the spleen. The oedematous infiltration extended beyond the larynx into the oesophagus and tissues of the neck generally, which were described as brawny, and also contained pus. Further, there was purulent pleurisy and pericarditis. (*St. Bartholomew's Hosp. Mus., 1615a.*)

The urine in many cases contains albumin, and, in some, sugar. Physical examination may reveal the involvement of the lungs and heart.

Diagnosis.—The suddenness of the symptoms and the marked prostration distinguish the disease from simple acute tonsillitis or laryngitis. Any œdema about the larynx is always suspicious, and early infiltration of the submaxillary or cervical regions is characteristic of Ludwig's angina. Albumin is frequently present in the urine, and the *Streptococcus pyogenes* is generally discoverable in the tissues.

Prognosis.—In a well-marked case the outlook is very serious. Although rapid recovery may take place in a few days, death may occur within ten or twelve hours. It may happen unexpectedly at any moment, and may even ensue after the local symptoms have subsided. Death may be due to œdema of the larynx or lungs, general infection, cerebral symptoms, or cardiac failure.

The prognosis of uncomplicated "hospital sore throat," and of simple serous inflammation of the epiglottis or arytenoids, is favourable. In all cases prognosis is chiefly based on the general symptoms, particularly those of toxæmia and prostration, often only revealed clinically by the anxious general expression, the waxy look, the sunken eyes, and the pinched-looking nose. A patient with a stricken look will die in a day, or even a few hours, while another who is unconcerned, yet with apparently identical local conditions, will make a good recovery.

Treatment.—The patient should be confined to bed and placed in the best conditions, as regards nursing, to husband his vitality. After a dose of calomel he should be given a supporting diet of good beef-tea, raw eggs, and milk. Brandy and strychnine may be indicated by the condition of his circulation. Inhalations of oxygen may be useful. An ice collar is sometimes recommended, but hot boric fomentations are generally more grateful. As several cases of good results from a polyvalent antistreptococcic serum have been recorded, it should be given in a dose of 20 c.c. as early in the disease as possible, and repeated in twenty-four hours if necessary. Tincture of the perchloride of iron and quinine are recommended. The œdematous uvula and larynx might be scarified with a guarded laryngeal knife. Large œdematous swellings in an acute case have been successfully dispersed by hourly applications of 1-5,000 solution of adrenalin chloride.* It is important to avoid any irritating or fatiguing local measures. Menthol or carbolic lozenges and the inhalation of chloroform and Friar's balsam can be recommended (Formula 13).

* Thomas R. French, *Brooklyn Med. Journ.*, Feb., 1905.

In the angina Ludovici form, a free incision should be made in the middle line from the chin to the thyroid cartilage, and deep enough (possibly 2 inches) to penetrate the diffuse infiltration. This incision can be done under local cocaine and adrenalin anæsthesia (*see* p. 81).

Suppuration in the pharyngo-maxillary triangle can only spread downwards along the carotid, and may even extend into the anterior mediastinum. When detected there should be no hesitation in making an incision along the posterior border of the sterno-mastoid muscle, and separating the tissue with the finger until pus is reached—frequently very fetid, but very small in quantity and diffused through much infiltrated lardaceous tissue. This should be done under local anæsthesia, the use of general narcosis being absolutely forbidden on account of the profound toxæmia affecting both the nervous system and the heart.*

Every preparation should be made for either tracheotomy or intubation (pp. 775 and 768). The former seems the less objectionable, as, although it opens fresh channels to infection, there is less traumatism than in the introduction of a metal tube into an inflamed larynx. The tracheotomy can be done under local anæsthesia (p. 71). It is well to remember that the operation does not necessarily stave off death from asphyxia, which may occur from pulmonary oedema or paralysis. It should be done as soon as any laryngeal stenosis declares itself, if the case is still hopeful, but the friends should be warned that it will not necessarily avert the danger of cardiac failure.

* A. Fallas, *Presse Oto-Laryngol. Belge*, Août, 1907, No. 8, p. 340.

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 Norval H. Pierce, *Trans. Amer. Laryngol. Assoc.*, 28th Congress, 1906, p. 49.
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 Philip R. W. De Santi, *ibid.*

PHLEGMONOUS INFLAMMATION OF THE EPIGLOTTIS

Angina epiglottidea anterior was the name given by Michel in 1878 to an acute inflammatory process confined, as a rule, to the anterior surface of the epiglottis, but sometimes affecting the larynx to a slight extent. In a strictly anatomical classification the present section should be transferred to the chapters on diseases of the larynx, but clinically it is more practical to consider it with other acute septic diseases of the throat.

The disease may be secondary to acute inflammation of the tonsils, pharynx, or lingual tonsil, or it may be primary and caused by septic infection, the swallowing of irritant fluids or substances, or the inhalation of pungent vapours. The symptoms come on suddenly with pain, dysphagia, attacks of choking and coughing on attempting to swallow, dyspnoea, fever, anxiety, and prostration.

The epiglottis is seen to be intensely inflamed, of uniform bright-red colour, swollen, and, later on, œdematous. The rest of the larynx, if visible, is generally normal.

Treatment, in addition to that generally recommended, should consist in the application of ice, the use of a spray of adrenalin chloride, and scarification which may set free foul-smelling, sanious pus. Tracheotomy may be necessary.

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GANGRENE OF THE TONSILS

Synonyms.—*Gangrenous angina*; *putrid sore throat*.

Definition.—A microbic infection of the pharynx, of a serious nature, and allied to the acute infectious phlegmon of the pharynx (p. 443). The pharynx, tonsils, and soft palate are generally attacked at the same time.

Etiology.—Gangrene is a rare affection, and usually secondary to the anginae complicating scarlatina, diphtheria, measles, smallpox, enteric, or erysipelas, or those occurring in the course of other diseases such as scurvy, pemphigus, herpes, or noma. In these latter cases it is generally met with in ill-nourished children. It occurs in severe types of tertiary syphilis. It is also found as a primary affection in adults who are debilitated, cachectic, or dirty, and may supervene on various ulcers in the

mouth. Large vessels may be invaded by its spread, and it may be accompanied by hæmorrhage into the lungs, bowels, or kidneys.

Bacteriology.—This is not settled. The ordinary buccal flora may be the cause, due to diminished local resistance: The *Leptothrix buccalis*, the spirilla and fusiform bacilli of Vincent, the pseudo-diphtheria bacillus, the *Bacillus coli*, and members of the Proteus group have been met with.

Symptoms.—These may be sudden—pain, rigors, and fever; or they may be slow and insidious—malaise, wasting, feebleness, insomnia, coated tongue, diarrhœa. Delirium may be present, or the mind may remain clear to the end. There are fetor and discharge from the mouth, dysphagia, and possibly regurgitation through the nose.

Examination.—At first the fauces are inflamed and swollen, and the uvula œdematous. Then patches, ulcers, sloughs, and localized gangrene are found on the tonsils. The glands at the angle of the jaw may be enlarged and very tender, but are often not affected. The temperature may not be raised, or may fall below normal. Albumin may appear in the urine, and petechiæ on the skin. The pulse fails; the extremities become cold; and cachexia is marked. Staphylococci and diplococci, and the pneumococcus in pure culture, have been found in swabbings (Fullerton, W. Pasteur).

Duration.—The disease may be rapid, or may last some weeks or even months. Death may be due to exhaustion, to broncho-pneumonia, or to sudden hæmorrhage from erosion of a large vessel.

Complications.—The necrosis may remain localized, or extend gradually to the surrounding tissues—the soft palate, uvula, posterior wall of the pharynx, and even, in the worst cases, the larynx and œsophagus. Phlebitis, septic cerebral and pulmonary embolism, broncho-pneumonia, nephritis, entero-colitis, and œdema glottidis have been met with.

Prognosis is grave; only 2 per cent. are said to recover.

Diagnosis.—In comparison with diphtheria the sloughs and odour are much more marked in this affection, and there is an absence of the wash-leather membrane and the bacterioscopic findings. It may, of course, complicate a case of diphtheria. From a tertiary specific lesion the history, situation of the disease, and results of treatment will assist in the diagnosis. Vincent's angina (p. 413) is closely related to gangrenous angina; In the latter the distinguishing features are the dark colour of the slough, the putrid, gangrenous smell, the progress of necrosis, the resistance to remedies, and the much greater general disturbance.

Treatment must be prompt and energetic. The throat should be well syringed (p. 60) with alkaline, warm lotions (Formula 29), and the cleansed surfaces swabbed with 1-40 carbolic. Sloughs should not be pulled off, from fear of hæmorrhage, but detached with peroxide of hydrogen, and the ulcers painted with nitrate of silver (gr. lx to ʒi). Fetor can be corrected with a mouth-wash of chlorine (Formula 38), a solution of hypochlorites, or antiseptic lozenges. A mixture of 1 drachm of tincture of the perchloride of iron in an ounce of glycerin is often ordered—a teaspoonful, undiluted, as a dose. Several authors recommend the tincture of the perchloride of iron in the larger dose of 30 or even 60 minims. Vaccines or injection of antistreptococcic serum may be tried. The recent success of salvarsan in Vincent's angina—locally or by intravenous injection—suggests that it might be of service (cf. p. 415). Small doses of opium, quinine, strychnine, and alcohol are ordered as required.

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CHAPTER XXXI

TUMOURS OF THE PHARYNX. HÆMORRHAGE FROM THE THROAT

INNOCENT GROWTHS

THERE is a general belief that benign tumours on the tonsil are practically non-existent. But papillomata are not uncommon, and, although rare, other forms of innocent growths are occasionally met with.

The following will be referred to, viz.: papilloma, adenoma, fibroma, lipoma, angioma, dermoid cysts, mixed tumours, and cysts.

Papillomata are not uncommonly met with on the soft palate and uvula, the pillars of the fauces, and the surface of the tonsil, where they grow out of a lacuna or from the plica triangularis* (Fig. 194, p. 362). They are irregular in shape, resembling little white warty fingers, or small white or grey papillated masses. Sometimes they are pale pink, or resemble a red polypus.† They may be sessile or pedunculated, and vary in size from a millet-seed to a hazel-nut. Sessile and pedunculated papillomata may be found in the same patient.‡ They consist of a fibro-vascular core, covered with the fimbriae of stratified epithelium.§

Adenoma occurs as a smooth or irregularly rounded growth, firm and sessile, and greyish or pinkish. It may be pedunculated, and can then only be diagnosed by the microscope. The usual sites for it are the palate, the sides of the uvula, and the tonsils.||

Fibromata are rare, and are to be distinguished from the fibromata growing from the naso-pharynx (cf. p. 345). They are smooth, hard, and sessile, but they may become lobulated and pedunculated (Fig. 222). They occur in the tonsils and neighbouring velum and palatine arches, but are also found beneath an intact mucosa, growing from the pharyngeal aponeurosis, and as large as a hen's egg.¶

* D. R. Paterson, *Proc. Laryngol. Soc., London*, v., Feb. 5, 1898, p. 44.

† W. Hill, H. T. Butlin, Jobson Horne, and M. Yearsley, *ibid.*, v., 1897, p. 6.

‡ H. Sharman, *ibid.*, v., May, 1898, p. 86.

§ Wyatt Wingrave, *ibid.*, v., Dec., 1897, p. 17.

|| Wyatt Wingrave, *Journ. of Laryngol.*, viii., 1894, No. 6, p. 358.

¶ Tanturri, *Arch. Ital. di Laringol.*, xxii., Aprile, 1902, p. 69.

¶ N. B. Odgers, *Brit. Med. Journ.*, May 25, 1907, p. 1236

Lipoma is extremely rare.* It is nearly always connected with the soft palate, where it occurs as a smooth, regular, or lobulated ovoid growth, yellowish in colour and conveying to the finger the suggestion of fluctuation or of a tense cyst. It is painless, and causes only local discomfort. When removed it may weigh an ounce. A lipoma may also occur under the mucous membrane of the posterior wall of the pharynx, where it may have to be diagnosed from a chronic

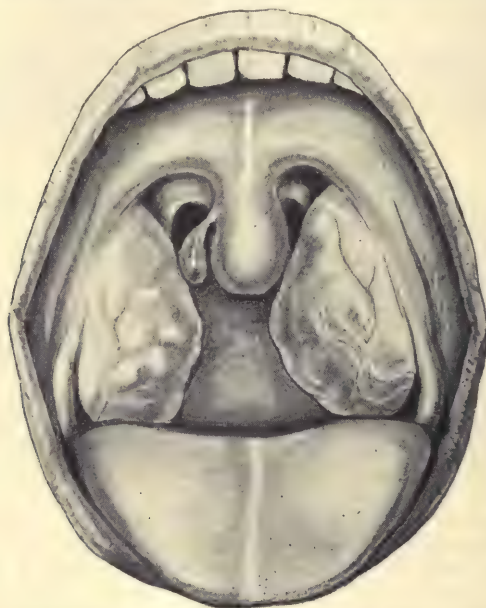


Fig. 222.—Large pedunculated tonsils in a man aged 23, who was subject to quinsies. A fibroma is seen on the uvula.

abscess; or it may grow from the supratonsillar fossa.† A fibro-lipoma may be congenital.‡

Angiomata are sometimes met with at the junction of the soft and hard palate, generally to one side, or on the posterior pharyngeal wall.

Dermoid tumours are seldom met with except at the autopsies of children who die at birth or soon afterwards. They are very rarely found in adults. Dermoid cysts are pedunculated, and are found to consist of fatty debris in a fibrous stroma together with muscle, skin, hair, sweat and sebaceous glands, and sometimes cartilage or bone.

* J. W. Bond, *Proc. Laryngol. Soc., London*, vi., Nov., 1898, p. 8.

W. Milligan, *ibid.*, ix., Jan., 1902, p. 41.

A. Onodi, *Rev. Hebd. de Laryngol.*, xix., 17 Juin, 1899, p. 696.

H. Gaudier, *Bull. de Laryngol.*, xii., 1 Jan., 1909, p. 1.

† G. Finder, *Arch. f. Laryngol.*, xv., 1903, fasc. 1, p. 159.

‡ L. Zolki, *Rev. Hebd. de Laryngol.*, xxv., 1904, No. 13, p. 394.

They may be connected with the foramen cæcum at the base of the tongue, or originate from any part of the naso-pharynx.*

A **teratoma** may be found as a heavy, fleshy-looking mass, firm, smooth, and slightly nodular, attached to the tonsil by a fibrous pedicle.†

Mixed tumours, similar to those which affect the parotid gland, are sometimes found, particularly on the palate. Pedunculated growths, 2 inches in length, and as large as a marble, sometimes hang from the surface of the tonsil (Fig. 223). On removal they are found to consist of ordinary tonsillar tissue.

Retention cysts, containing serous products—syrupy, colloid, thick like sebaceous matter, yellow, or red like prune juice—may occur wherever there is lymphatic tissue in the pharynx, but, of course, are most frequent in the palatine tonsils. Often they are not cysts, but obstructed crypts with dilated walls. They may show through the thinned-out but intact mucosa like yellowish-white or brown buried masses. If neighbouring crypts are affected, the septa between them get destroyed, and a larger cyst is formed. This may discharge, more or less intermittently, from the surface of the tonsil as a chronic abscess (Fig. 197, p. 378).

Symptoms.—These vary very much. Innocent growths are frequently discovered accidentally. In other cases they cause mechanical symptoms—interference with swallowing, breathing, or speaking—which are generally more marked at night. An angioma might cause hæmorrhage. A dermoid cyst may have such a long pedicle that it can hang into the larynx or be projected from the mouth.

Treatment.—Many simple tumours of the pharynx can be left alone. If they cause irritation, the method of removal will depend on whether they are pedunculated or encysted. In the former case an application of cocaine is sufficient to allow of the growth being seized with forceps, and cut off with blunt-pointed



Fig. 223.—Pedunculated mass of normal tonsillar tissue. Life-size.

* V. Texier, *Presse Méd.*, 19 Déc., 1900, No. 104.

Paul Caraguel, Thèse de Paris, 1906-7.

† R. Fullerton, *Brit. Med. Journ.*, Oct. 12, 1907, p. 963.

scissors. When encysted, an incision is made over the growth, which is then shelled out with the fingers, and the wound closed with catgut stitches. This may require a general anæsthetic. When the tumour affects an enlarged tonsil, the simplest operation is a tonsillectomy (p. 387). In removing an angioma, precautions must be taken against hæmorrhage by making the incisions around the growth through healthy mucosa, and having a Paquelin or galvanic cautery at hand.

MALIGNANT GROWTHS

In this section we will include cancer of the pharynx, tonsil, fauces, soft palate, and uvula (Plate XIV., Fig. 2, facing p. 442).

In the pharynx itself malignant disease is rare as a primary affection; it is generally secondary, by direct propagation in the later stages of cancer of the larynx, base of the tongue, tonsil, or œsophagus. Carcinoma or sarcoma may occur, and the former is said to be more common.

Etiology.—Both forms of cancer are more common after 40 years of age, but sarcoma may occur in quite young subjects, and then more frequently attacks females.* Epithelioma is more common in males.

SARCOMA

Sarcoma may occur in the forms of (1) round-celled, (2) spindle-celled, (3) mixed round- and spindle-celled, (4) alveolar, (5) melanotic, (6) myxo-sarcoma, (7) lympho-sarcoma.

It generally begins in the tonsil, but may start in the soft palate, fauces, or posterior wall. It may grow to some size before the mucosa over it, which is dull and injected or greyish, is broken through. The tumour is not so hard as an epithelioma, but it is firm, although it may even feel somewhat soft and cyst-like. There is little or no infiltration beyond its margins. Hence a sarcoma may remain more or less encapsuled and limited for some time, and the growth may appear to increase very slowly, or even to recede slightly. When it extends it is generally towards the angle of the jaw, and large swellings then appear in the neck. But glands are late in appearing. So, too, ulceration of the surface of the growth is not an early symptom, and fungation and bleeding are not so marked as in carcinoma.

Sarcoma of the pharynx may run a rapid course in twelve months, or it may extend over years.

Lympho-sarcoma is a rare affection of the throat, and is

* C. F. Theisen records a case in a child of 8, *Ann. of Otol.*, xvi., June, 1907, No. 2, p. 349.

frequently overlooked. It generally attacks middle-aged men. It occurs as an infiltration of one tonsil, or a definite tumour of the side of the pharynx. Smaller growths may coalesce, and the surface may break down and ulcerate, although discharge from the surface is not a marked feature, and bleeding is absent. Periods of fever and temporary diminution of the growths may occur.

In **lymphadenoma** (Hodgkin's disease) enlargement of the tonsils is but a part of a widespread affection in which the glands in the neck, axilla, and elsewhere, as well as the liver and spleen, are enlarged but not painful. It is sometimes temporarily amenable to arsenic. The favourite age for lymphadenoma is from 30 to 45.

CARCINOMA

Carcinoma, chiefly in the form of epithelioma, may attack the soft palate, fauces, tonsils, or lower pharynx—the laryngo-pharynx is the favourite site in females. It begins as an uneven, mulberry- or wart-like growth which soon ulcerates (Fig. 224). It may be limited for some time, but when it extends the surrounding area is rapidly invaded. The ulcerated surface is irregular and fungating. It bleeds readily, and has a border of wart-like or sprouting growths, which are very hard and knobby to the touch, bleed easily, and soon break down to share in enlarging the ulcerating surface. Beyond this ring is a zone of congested and infiltrated tissue. Sometimes the tumour may reach some size before it breaks down into an ulcer with hard edges, which recede as destruction advances. (Plate xiv., Fig. 2, facing p. 442:)

The glands at the angle of the jaw are generally enlarged early, and are very hard and adherent. It is noteworthy that the glandular enlargement may take place on the side opposite to the growth.

Symptoms.—In malignant disease the patient at first will simply complain of discomfort in the throat and interference with speaking, swallowing, and nasal respiration. Sharp pains develop early, and radiate to the neck, ears, or angle of the jaw. With the increase of the growth, the voice becomes more throaty, respiration is seriously interfered with, there are salivation, great dysphagia, blood-stained sputum, dreadful fetor, septic mouth, marked cachexia, and enlargement of the glands. Attacks of suffocation or hæmorrhage may occur, œdema may be started in the larynx, and there is rapid wasting, often increased by pain and insomnia.

Diagnosis.—The age of the patient, the one-sided affection, spontaneous pain, and progress of the disease will decide the diagnosis, to be confirmed later by the enlargement of the glands, the sanious

sputum, and, possibly, the results of microscopic examination. An enlargement of one tonsil, commencing in an adult, must always be regarded with grave suspicion. These factors will serve to distinguish a malignant growth from chronic hypertrophy of the tonsils, benign growths, lupus, diphtheria, or retropharyngeal abscess.

The confusion which is most apt to occur is with tertiary syphilis, or this may also be unilateral, ulcerating, fetid, firm, and with

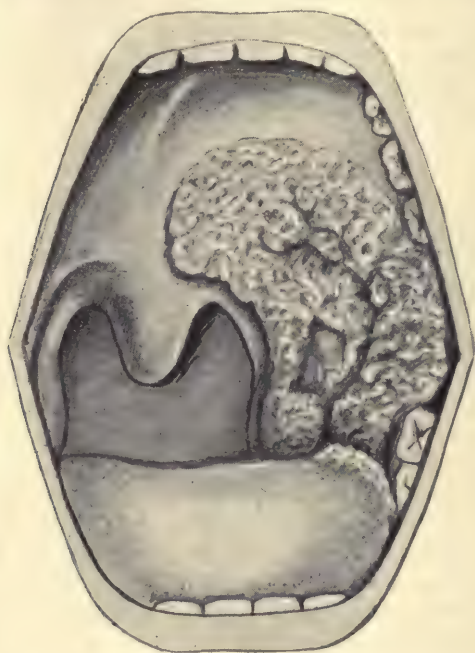


Fig. 224.—Malignant disease of pharynx.

enlarged glands. But the margin of an ulcerating gumma does not feel so like cartilage; pain and cachexia are less; progress is more rapid in syphilis; and improvement under antisymphilitic treatment is the rule. A Wassermann reaction may be positive, and the *Spirochæta pallida* may be discovered, though only with difficulty in tertiary deposits. An ulcer with a sloughing base and a ser-piginous border suggests syphilis; with a sprouting and bleeding surface it would be suspicious of cancer. The latter, under mercury and iodide of potassium, may, of course, show some improvement, but this is temporary. The two affections may be combined. Finally, if a good-sized piece of the growth can be obtained with the punch-forceps, the microscope may settle the diagnosis.

For purposes of both prognosis and treatment it is desirable to be able to differentiate a carcinoma from a sarcoma. In the former we find a hard, bluish-pink growth, with inflamed areola, irregular surface, infiltration, interference with the movements of the lower jaw, and early affection of glands; hæmorrhage occurs earlier from an ulcerating and fungating surface; spontaneous pain is an early symptom. A sarcoma is smooth and soft, and looks pale-pink or even yellow below an intact mucosa. The microscope may show the difference, if a good-sized piece of growth can be obtained.

Prognosis.—In carcinoma this is very grave. The progress may appear slow before ulceration occurs, but then it advances rapidly, so that a case may terminate fatally in six to eighteen months. In the case of sarcoma the outlook is more hopeful, as it remains localized for some time, and progress is occasionally slow, extending over years. Even recurrences can be dealt with more satisfactorily. Death may occur from cachexia, inanition, hæmorrhage, suffocation, or intercurrent disease. Cases of carcinoma have been operated on, and had no recurrence six years after operation.*

Treatment.—This is guided by the situation, extent, and nature of the growth.† Epithelioma, which does not often come under observation until the glands are considerably invaded, is rarely operable. Sarcoma may go on for years without ulceration or pain, so that the progress of a case and the age of the patient must be taken into consideration. In any case a sarcoma holds out more promise of a successful removal, for the reasons already mentioned.

When the growth is extensive, invading not only the tonsil, but also the base of the tongue, or the side of the larynx, or the lower pharynx, it is not likely to be suitable for operation. The most promising cases are those where the disease is more or less limited to the tonsillar region. Here a malignant growth can be operated on (*a*) through the mouth, (*b*) from the side of the neck, or (*c*) by a combination of the two methods.

As free hæmorrhage is always possible, it is advisable to perform a preliminary laryngotomy, and plug the laryngo-pharynx with a sponge (cf. p. 83). The tonsil can be enucleated by dissection (see p. 400), and the growth, with a sufficient margin of healthy tissue, can then be clipped away with blunt-pointed scissors curved

* David Newman, *Brit. Med. Journ.*, Jan. 2, 1897.

† A. Castex, *Bull. de Laryngol.*, xii., 4th, 1 Oct., 1909, p. 242; and XVI Cong Internat. de Méd., Budapest, 1909, Section xv., 1st fasc., p. 222.

Durand and Gault, "Traitement Chirurgical des Tumeurs du Pharynx par Voie Buccale," Soc. Franç. d'Oto-Laryngol., 1912; and *Ann. des Mal. de l'Oreille*, xxxviii., 1912, No. 7, p. 24.

on the flat. If the growth is larger, more access to it can be obtained by slitting the cheek backwards from the angle of the mouth to the ramus of the jaw.

Malignant disease of the tonsil can be reached by Vohsen's method. An incision is made from the tip of the mastoid to the great cornu of the hyoid bone, and then curved forwards and upwards for one inch. The external carotid is isolated, and the lingual, facial, and ascending pharyngeal branches are ligatured. The jaw is then divided in front of the masseter, and the ascending ramus pulled strongly forward over the horizontal ramus. This gives free access to the pharyngeal wall, and allows of the tonsil and any enlarged glands being dissected out. The pharyngeal wound is afterwards sutured with catgut, and the jaw united with silver wire.*

In many cases it is desirable to commence from the outside by clearing the glands, fat, and fascia from the anterior triangle of the neck, and placing temporary ligatures around the common, external and internal carotids.

If the growth has spread farther, extensive operations from the outside—lateral pharyngotomy, subhyoid pharyngotomy, or division of the lower jaw—will be required.† The reader is referred to works on general surgery for their full description.‡

The chief dangers of these operations are broncho-pneumonia, recurrence of growth, and hæmorrhage either immediately following or eight to twelve days after operation.

Palliative treatment.—The mouth and throat must be kept as clean as possible by the tooth-brush, alkaline mouth-washes with sanitas, boroglyceride, or carbolic, and antiseptic lozenges of carbolic, formalin, or iodoform. Adrenalin sprayed into the throat helps to check hæmorrhage, and even retard progress. Pain is relieved by insufflations of orthoform, or by allowing a morphia tablet to be dissolved in the mouth. The use of cocaine should be deferred, and is not in any case suitable for a continuance. Sooner or later, hypodermic injections of morphia are called for.

In some cases, progress can be checked by applications of arsenious acid, in strengths varying from 1-150 to 1-50, in equal parts of water and alcohol.§ Radium, while ineffective in carcinoma, sometimes produces remarkable temporary decrease of a

* Vohsen, *Journ. of Laryngol.*, March, 1909.

G. Wilkinson, *Proc. Roy. Soc. Med.*, Laryngol. Section, Feb. 4, 1910.

† Justus Matthews, *Laryngoscope*, xxii., 1912, No. 5, p. 737.

‡ Wilfred Trotter, *Lancet*, April 19 and 26, 1913.

§ Bobone, *Bollet. delle Mal. dell' Orecchio*, xix., 1901, No. 12.

sarcoma, with great relief to symptoms. Diathermy is also a palliative of some promise (*see* p. 224).

Tracheotomy may be required, and, if sufficient nourishment cannot be swallowed, a gastrostomy should be performed before the patient becomes too weak. It not only enables him to feed and recover from the depression of inanition, but the local rest conduces to arrest of pain and relief of other local symptoms.

HÆMORRHAGE FROM THE THROAT

(HÆMOPTYSIS NOT OF PULMONARY ORIGIN)

The laryngologist is not infrequently asked if he can find in the throat the source of origin of expectorated blood. But, as a matter of fact, hæmorrhage from the throat is rare, and is, as a rule, only secondary to some serious local affection. Otherwise, the blood, with few exceptions, comes from the lungs. This source is often overlooked, as the misconception is general that blood from the lungs must be coughed up, or be frothy from admixture of mucus, or be accompanied by physical signs in the chest. But in the early stages of pulmonary tuberculosis there is no catarrh or mucus to become mixed with the blood, and no cough, so that pure blood from the lungs may cause no symptoms until it is simply hawked or cleared out of the pharynx.

The other sources of hæmoptysis can be tabulated as follows:—

1. Epistaxis (p. 110), when the blood flows backwards.
2. Adenoids.
3. Enlarged veins in the pharynx, and around the base of the tongue, especially in gout, cirrhosis of the liver, and influenza.
4. Suppuration and ulceration in connexion with malignant disease, syphilis, peritonsillar abscess, and (rarely) lupus or tuberculosis.
5. Spongy gums.
6. Multiple telangiectases.
7. Vicarious menstruation.
8. Trauma from accidental injury, the passage of instruments, rupture of veins by vomiting, or surgical operation.
9. Laryngeal hæmorrhage, especially in the acute laryngitis of influenza.
10. From the trachea—varicose veins, congestion from pressure of enlarged thyroid gland, or of an aneurysm.*
11. Various blood conditions—purpura, scurvy, pernicious

* F. Massei, *Arch. Ital. di Laringol.*, Ottobre, 1898.
Pisenti, *ibid.*, Luglio, 1899.

anæmia, leukæmia, hæmophilia, mercurial stomatitis, phosphorus-poisoning, cirrhosis of the kidneys or liver, and certain acute fevers, especially enteric and yellow fever, hæmorrhagic smallpox, and influenza.*

Gout, according to Semon and Watson Williams, is, comparatively speaking, the most fertile source of pharyngeal hæmorrhage.

Bleeding from the surface of the laryngeal mucous membrane must be distinguished from submucous hæmorrhage (cf. p. 493, and Plate xvi., Fig. 1, facing p. 500). Blood-clots may not be expelled, but remain lodged in or near the vocal cords, so as to simulate the appearances of an angioma, carcinoma, or a soft fibroma.† (Plate xviii., Fig. 4, facing p. 520, and cf. p. 526.)

Symptoms.—A slight clearing of the throat is often all that precedes the patient's discovery of blood in his mouth. If it comes in any quantity, the expectoration is accompanied by the peculiarly sickening and depressing taste and smell of blood.

When no trace of a leaking vessel is visible, the case should be treated as one of early pulmonary tuberculosis, particularly if any of the suspicious indications mentioned on p. 637 are present.‡

Treatment.—Treatment depends on the discovery of the source of bleeding. The local bleeding may require adrenalin, hamamelis (Pond's extract), catechu, or other astringents. The galvanocautery, if at hand, is often the speediest remedy. When large vessels are eaten into by cancer or abscess, it may be necessary to tie the external or common carotid.

The administration of lactate of calcium will increase the coagulability of the blood. A hypodermic injection of morphia, gr. $\frac{1}{6}$ – $\frac{1}{4}$, with atropine, gr. $\frac{1}{200}$ – $\frac{1}{150}$, is one of the readiest, quickest, and most reliable remedies.

In all cases the patient should be ensured complete rest and fresh cool air. Alcohol and hot fluids should be forbidden; solid food is not necessarily avoided. Excitement and fear must be guarded against. The sucking of ice, a weak spray of adrenalin, and small doses of opium may be indicated. (Cf. Arrest of Hæmorrhage, p. 83.)

* James E. Newcomb, *Trans. Amer. Laryngol. Assoc.*, 26th Congress, 1906, p. 251.

† F. Semon, *Arch. f. Laryngol.*, iv. 418.

F. Semon, *Ann. des Mal. de l'Oreille*, xxv., 1899, No. 3, p. 241.

Von Geyer, *Munch. med. Woch.*, 1898, No. 15, S. 457.

‡ David Newman, "Hæmoptysis in Apparently Healthy Persons." *Glasgow Med. Journ.*, Nov., 1890; and *Brit. Med. Journ.*, May 29, 1897.

CHAPTER XXXII

NEUROSES OF THE PHARYNX

Innervation.—The soft palate, uvula, the levator palati and pharyngeal constrictors, according to Horsley and Beevor, are innervated by spinal accessory fibres in the pharyngeal plexus, and do not derive their nerve supply from the vagus. Later observers claim that the pneumogastric is the sole motor nerve of the palate.* The soft palate is not supplied from the facial nerve, as was once thought.

Varieties.—The neuroses of the pharynx may be considered as they are (A) motor, or (B) sensory.

A. MOTOR NEUROSES

These are either (a) paralytic, or (b) spasmodic.

(a) *Paralytic Neuroses*

Paralysis of the soft palate, and, more rarely, of the constrictors of the pharynx, may be due to—

1. Neuritis after diphtheria, which is the most common cause. Neuritis attributable to influenza, lead-poisoning, other membranous exudations, or even acute lacunar tonsillitis, is said to occur, but it must be a rare event.

2. Implication of the nerve-roots between their emergence from the side of the bulb and their exit from the cranium through the jugular foramen—chiefly caused by meningitis (syphilitic) and malignant affections of the basis cranii. Pressure in the neck on the branch of the vagus before the pharyngeal branches are given off may be due to malignant, tubercular, or other growths.

3. Bulbar lesions: chronic bulbar paralysis (glosso-labio-laryngeal paralysis); bulbar apoplexy or embolism; tumours pressing on the bulb; tabes dorsalis; syringo-myelia of the bulb (syringo-bulbia).†

4. Upper motor segment lesions, such as severe cases of apoplexy, are sometimes accompanied by paresis of the palate on the hemiplegic side.

* L. Réthi, *Arch. Internat. de Laryngol.*, xxviii., 1909, No. 6, p. 505.

† Jobson Horne, *Proc. Laryngol. Soc.*, London, iv., Jan., 1897, p. 104.

H. Tilley, *ibid.*, vi., Dec., 1898, p. 21.

5. Paralysis of the soft palate may also be functional.

When of central origin, neighbouring muscles are frequently implicated, so that there are associated symptoms of interference with the movements of the tongue, larynx, sterno-mastoid, or trapezius (cf. p. 555).

Symptoms.—The paralysis may be more or less complete, and unilateral or bilateral. Owing to the want of contraction in the muscles the soft palate fails to rise and shut off the postnasal space from the pharynx, so that the voice assumes the open or cleft-palate character of rhinolalia aperta, and fluids tend to regurgitate through the nose. For the same reason the patient is unable to whistle, suck, blow his cheeks out, or pronounce the word "wrong," while "rub" becomes "rum," and "egg" is pronounced "eng." These deficiencies can be temporarily made good by closing the nostrils with the thumb and forefinger. If the paresis is incomplete or unilateral, the modifications of voice and deglutition are much less marked.

Many cases of paralysis are accompanied by a diminution or loss of sensibility, so that food is apt to "go the wrong way," irritating the larynx and causing cough.

Examination will show that the soft palate has lost its elastic look of tension, and limply hangs downwards and forwards. It does not move when the patient is asked to say *Ah*, and no reflex contraction is produced on touching it with a probe. Tactile sensibility is diminished in many cases. If the affection is unilateral, the palate will be seen to draw up and dimple on one side, while the other remains inert. (Cf. Plate XIX., facing p. 560.)

Paralysis of the constrictors of the pharynx is most commonly the result of hysteria (cf. Functional Dysphagia, p. 597), or of a central lesion as in bulbar paralysis, but it may occur as a sequel of diphtheria (p. 725).

Diagnosis.—True paresis must be diagnosed from functional impairment due to inflammation, infiltration, accidental bruising or impeded movement (as in quinsy). Stricture of the œsophagus and painful diseases in the laryngo-pharynx and base of the tongue must be excluded. It will be noticed that solids are more easily swallowed than liquids—the reverse of what occurs in organic obstructions—and that deglutition is assisted by pinching the nostrils.

Hysterical subjects, thrown in contact with cases of palatal paralysis, will often reproduce the cleft-palate voice most successfully. But if asked to whistle or to blow out a candle they are generally successful; and contraction of the soft palate can be stimulated by tickling it.

Duration and prognosis will, of course, depend on the cause. In most central lesions the paralysis is permanent and of serious import.* When due to diphtheritic or other neuritis it may last weeks, or even months, but generally gets well. One side may recover before the other, so that the case then simulates a unilateral paralysis of the palate. (*See Diphtheria*, p. 722.)

Treatment.—The general treatment will be directed by recognition of the cause. In most central nerve-lesions it is of little avail. Syphilitic cases or operable growths are more hopeful. If caused by diphtheria or influenza it is usual to give tonics of strychnine and iron. Hysterical cases should be treated by suggestion and on the lines proposed in functional aphonia (p. 550). Toxic (diphtheria, influenza) and functional cases are helped by gargling, humming, and various vocal exercises. The faradic current can be used either externally or internally.† Paralysis of the pharyngeal constrictors may necessitate feeding by the stomach-tube.

(b) *Spasmodic Neuroses*

Spasm of the pharynx may be (1) tonic, or (2) clonic.

1. Tonic spasm of the pharynx occurs in hydrophobia and tetanus; tumours pressing on the bulb; locomotor ataxy; acute local affections, such as acute tonsillitis; and functional disorders, usually hysteria (*globus hystericus*).

Apart from the terrible manifestations in hydrophobia and tetanus, pharyngeal spasm is almost always of functional origin.

2. Clonic spasm or nystagmus of the pharynx may be met with (i) in organic disease of the brain, chiefly of the pons or cerebellum, or (ii) as a reflex neurosis.

In clonic spasm, contractions may recur at the rate of 60 to 160 times per minute, or even increase up to 240 per minute,‡ and be accompanied by an audible clicking sound.§ The movements may affect the soft palate and posterior pharyngeal wall, and be associated with synchronous twitchings of the arytenoids, or rapid movements of adduction in the vocal cords.|| Only one

* Charles E. Beevor, *Clin. Journ.*, Oct. 7, 1896.

† W. Aldren Turner, *Laryngoscope*, v., July, 1898, p. 33.

‡ L. H. Pegler, *Proc. Laryngol. Soc., London*, x., April, 1903, p. 106.

§ G. A. Garry Simpson, *Med. Press*, Nov. 23, 1904, p. 547.

|| J. W. Bond, *Proc. Laryngol. Soc., London*, iii., Jan., 1896, p. 41.

H. L. Lack, *ibid.*, v., Jan., 1898, p. 38.

H. L. Lack, *Laryngoscope*, June, 1898.

F. Semon, *Proc. Laryngol. Soc., London*, viii., Jan., 1901, p. 49.

F. J. Steward, *ibid.*, x., March, 1903, p. 84.

L. H. Pegler, *ibid.*, x., April, 1903, p. 105.

F. Semon, *ibid.*, xii., Jan., 1905, p. 38.

Sinnhuber, *Ann. des Mal. de l'Oreille*, 1906, ii., No. 7, p. 91.

side may be affected.* The patient may be quite unaware of the spasm, and it may be discovered for him by accident.

Synchronous clonic contractions of the tongue, the muscles of the eye, and the diaphragm have been reported in some cases. The contractions may continue during sleep.

Treatment.—Treatment does not promise much when pharyngeal nystagmus is of central origin. In other cases, reflex sources of irritation must be sought and treated, while the irritability is allayed with bromides. Functional cases will require the usual nerve tonics (iron, arsenic, strychnine, and quinine), with suitable general and psychical treatment. The continuous or high-frequency currents may be useful.

B. SENSORY NEUROSES

These include anæsthesia, hyperæsthesia, paræsthesia (perverted sensibility), and, rarely, true neuralgia.

Anæsthesia may be due to hysteria, peripheral neuritis (diphtheria), bulbar paralysis, general paralysis of the insane, or pressure on the glosso-pharyngeal nerve. It may be partial or complete, and unilateral or bilateral. In organic cases there is commonly associated paralysis of the larynx. If the anæsthesia is of such a degree as to permit of food entering the larynx, it is a serious condition; otherwise the symptom is little noticed.

Hyperæsthesia, and the abnormal sensations of **paræsthesia**, lead patients to complain of soreness, irritation, burning, dryness, tickling, scraping, choking, strangling, causing constant hemming and hawking, a desire to swallow although conscious that there is nothing to swallow, and a sensation as of some foreign body in the throat, such as might be caused by a hair, crumb, or needle.

Neuralgia is a rare condition. Acute lancinating pains are then complained of, radiating from the pharynx to the neck.

Etiology.—Most cases are found among the hysterical and neurotic, but these sensations are also met with in the anæmic, gouty, dyspeptic, alcoholic, and hypochondriac. Patients with pulmonary tuberculosis will sometimes complain of sensations in the throat before any lesion is evident in the larynx; and those with malignant disease will often manifest early hyperæsthesia. On the other hand, neurotic subjects may live in dread of one or other of these diseases, owing to the purely subjective sensations in the throat.

Women at the menopause are particularly apt to suffer from

* H. Klein, *Deut. med. Woch.*, April 21, 1904, No. 17, S. 619.

E. B. Coburn, *Laryngoscope*, xv., July, 1905, p. 567.

hyperæsthesia and paræsthesia of the pharynx. They are frequently very depressed mentally.*

Examination.—The upper air-passages should be carefully examined to make sure that there is no direct or reflex source of irritation. Latent lesions in the nose are not infrequently overlooked, and affections of the lingual tonsil may escape notice. The search for reflex sources of irritation may have to be directed to the ear, for cerumen or foreign body; to the eye, for refractive errors; and to the teeth, the gastro-intestinal tract, and the pelvic organs, as well as the heart, lungs, and kidneys.

Diagnosis is arrived at by a process of exclusion. It is important not to overlook early tuberculosis, commencing malignant disease, or the anæmia frequently associated with a fibroid tumour or other uterine affection. While not neglecting any possible cause, we must guard against attributing the symptoms to some trifling local condition. If undue regard is given to some slight granular pharyngitis or tonsillar irregularity, the patient's attention is only too likely to be increasingly concentrated on the throat.

Treatment.—When the sensory neurosis is clearly functional, general treatment is of primary importance, and should be directed to the habits, hygiene, digestion, or uterine and other functions. Rest or exercise, change of scene or seclusion, the simple life or a little excitement, will be advised according to the condition of the patient. In any case his confidence must be won, so that, by suggestion, he may feel assured that his sensations can be neglected. Nervine tonics, iron, arsenic, phosphates, stomachics, or bromides will be called for under different circumstances.

Local treatment should be avoided altogether, if possible. Certainly the free use of the galvanic or other cautery, and the prescribing of such anodynes as cocaine or morphia, are worse than useless. If some local application is inevitable, the most suitable are lozenges, or sprays, containing menthol, resorcin, carbolic acid, or antipyrin. They diminish the local sensitiveness, without ulterior bad effects. (Formulæ 28 and 42.)

When anæsthesia is due to bulbar lesions we can only guard the patient from the risk of "swallowing-pneumonia" by the use of the stomach feeding-tube. The same precautions may be required in marked cases of diphtheritic neuritis, but this affection generally disappears under the same treatment as that required for the paralysis of the palate (p. 463).

* F. Semon, *Brit. Med. Journ.*, 1895, i., Jan. 5.

REFERENCE

- F. E. Hopkins, "Neuroses of the Pharynx," *Trans. Amer. Laryngol. Assoc.*, 1940; and *Laryngoscope*, xiv., 1904, No. 7, p. 506.

PART VI.—DISEASES OF THE LARYNX

CHAPTER XXXIII

ANATOMY OF THE LARYNX

THE larynx, or voice-box, is mainly formed by the two large cartilages, the thyroid and cricoid. The latter is the true base of the larynx, as it supports not only the thyroid, but also the smaller arytenoid cartilages, the cartilages of Santorini (cornicula laryngis), and the cartilages of Wrisberg (cuneiform cartilages). We have also to consider the cartilaginous epiglottis which is attached to the inner surface of the thyroid alæ, and the hyoid bone which assists in slinging the larynx in position, and so shares in many of its movements.

We shall assume that the detailed anatomy is so well known that it is sufficient to give an outline of the general characteristics and topographical relations of the larynx.

On passing the hand below the chin, backwards and slightly downwards, the first firm body met with is the hyoid bone. This is on a level with the 4th cervical vertebra, and on palpating it with the thumb and second forefinger the larger cornua can be felt passing backwards and slightly upwards to the large vessels in front of the spinal column and below the ramus of the jaw. The extremities of these cornua are visible on laryngoscopic examination overhanging the sinus pyriformis (Fig. 33, 6, p. 40).

Immediately below the hyoid bone in the middle line, the notch of the upper border of the thyroid cartilage is very visible in men, and is always readily felt in either sex. It is an important surgical landmark. With the forefinger resting on the thyroid notch, and the thumb and second finger applied over each lateral plate (ala), an idea of the size, situation, and movements of the larynx is obtained. It will be noticed that it rests against the spinal column (the soft and flattened œsophagus only intervening), on which it can be moved from side to side, when a grating can frequently be both felt and heard (cf. *Injuries of the Larynx*, p. 469). In quiet respiration there is no appreciable movement

of the larynx upwards or downwards. It is very different when there is any obstruction to the air-way (*see Stenosis*, p. 574). During vocalization the larynx remains stationary, but in the emission of higher notes it is felt to be raised. Advantage is taken of this in laryngoscopic examination, when the patient, by saying *E*, brings the whole larynx nearer to the examining mirror. But the greatest excursions of the larynx will be felt to take place during swallowing, and it will be realized that anything firmly attached to the larynx or trachea can be seen and felt to move with the act of deglutition.

Passing the finger downwards on the thyroid cartilage, an interval is felt between its lower margin and the cricoid cartilage, filled by the crico-thyroid membrane. A small but important lymph-gland lies immediately in front of this membrane.

The front of the cricoid ring is an important surgical landmark. In a child of 3 months it is on a level with the lower border of the 4th cervical vertebra; at the age of 6 years it is as low as the 5th cervical vertebra; and at puberty it has descended to the 6th vertebra, the one with the "carotid" tubercle, and is at the same level as the omo-hyoid muscle.

Below the cricoid cartilage the larynx is connected with the trachea by the crico-tracheal membrane. About seven or eight rings of the trachea are present in its neck portion (Fig. 321, p. 777). In the lower portion of its cervical course the trachea lies at some distance, about $1\frac{1}{2}$ inches, from the surface, and as it passes behind the manubrium sterni it is on a level with the disc between the 2nd and 3rd dorsal vertebræ (Fig. 299, p. 753).

The isthmus of the thyroid gland crosses the trachea at the 2nd, 3rd, and 4th rings (Fig. 321). It can seldom be palpated in health. The lateral lobes of the gland ascend on each side and partially cover the two lateral plates of the thyroid cartilage. Occasionally a third lobe, known as the pyramidal lobe, extends upwards in front of the trachea and cricoid cartilage, being suspended from the hyoid bone by the suspensory ligament of the thyroid gland.

The rima glottidis corresponds to the centre of the middle of the anterior margin of the thyroid cartilage. It measures about 1 inch from before backwards, and $\frac{1}{2}$ inch at its widest, though this may increase to $\frac{1}{2}$ inch. In females, and in males before puberty, the glottic space measures 8-9 lines antero-posteriorly.

The mucous membrane varies in different parts of the larynx, both in structure and in thickness. Acinous glands are numerous where the mucosa is thickest, i.e. in the ventricles of Morgagni, the ventricular bands, and on the pharyngeal surface of the larynx.

Over the vocal cords the mucous membrane is very thin and closely adherent, and glands are very scanty. Stratified, pavement epithelium is found (1) on the true vocal cords, (2) the pharyngeal surface of the larynx, (3) the posterior surface of the epiglottis, and (4) over part of the ary-epiglottic folds. Ciliated epithelium clothes the rest of the larynx.

The actions of the intrinsic muscles of the larynx are described on p. 537, and the innervation is considered on p. 539.

In infancy and childhood the larynx is not only much smaller than in the adult, but it is relatively small in proportion to the development of other regions. In the new-born infant the largest diameter of the glottis is only about $\frac{1}{8}$ inch, and the cartilages composing it are soft and compressible. In adult males, as already described, the antero-posterior opening of the larynx may be 1 inch.

In adults, especially in males, the cartilages are apt to become so ossified that they will fracture before yielding, and in operations may require to be divided by means of a saw or cutting pliers.

Fig. 1.—Soft fibroma projecting from the ventricle of Morgagni ; so-called prolapse of the ventricle. (*See* p. 514.)

Fig. 2.—Laryngeal erysipelas. (*See* p. 443.)

Fig. 3.—Gummatous infiltration of the left vocal cord, of which the mobility is slightly impaired. (*See* p. 687.)

Fig. 4.—Syphilis of the larynx. Hypertrophic infiltration of the epiglottis ; swelling of the ary-epiglottic folds ; injection and impaired abduction of the vocal cords, from perichondritis of the crico-arytenoid articulation. (*See* p. 688.)

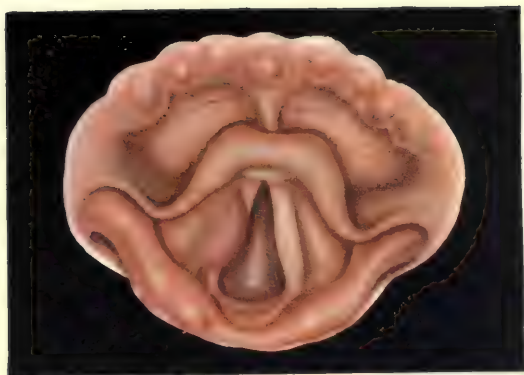
Fig. 5.—Early tuberculosis. Note the anæmic epiglottis, with two small nodular eminences on the left side ; the paresis of tension in the right cord ; and the limited area of redness of the left cord. (*See* p. 637.)

Fig. 6.—Tuberculosis in an elderly man. The case was for some time mistaken for malignant disease, but the commencing ulceration of the cord is indicative of tubercle. (*See* p. 645.)

Fig. 7.—Carcinoma of the larynx. The left side remains immobile during phonation. (*See* p. 521.)

(Figs. 1, 2, 3, 4, 5, and 7 are from Grünwald's "*Atlas and Abstract of the Diseases of the Larynx.*")

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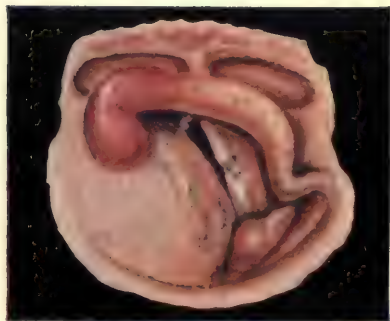
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CHAPTER XXXIV

INJURIES, FRACTURES, AND DISLOCATIONS. CONGENITAL AFFECTIONS

INJURIES AND FRACTURES

Etiology.—Three or four cases are on record in which the hyoid bone has been fractured by muscular action, but direct violence is the usual cause of fractures of the laryngeal cartilages. They are not of common occurrence, and this is probably due to the elasticity of the cartilages, the protection afforded by the lower jaw, and the mobility of the larynx as a whole.

Injuries and fractures are more common in adult life, but doubtless only because in infancy and old age there is less exposure to accident. For the same reason they are more frequent in men than in women.

Direct violence, or direct compression (garrotting), may produce fracture, but concussion is not sufficient unless applied directly while, at the same moment, either the vertebral column or the front of the neck is a fixed point. One or other of these conditions occurs in street accidents, kicks from horses, acrobatic performances, or when a cyclist is flung forwards against the handle-bar. Fracture of the larynx is rare in hanging, as the cord slips upwards and only breaks off the great cornua of the hyoid.

Mechanism and pathological anatomy.—The thyroid cartilage is generally the one affected; the cricoid gives way more rarely. The thyroid may fracture on account of its anterior angle being enlarged or compressed—the latter is the more common event, as blows are generally delivered obliquely. The fracture may be central, vertical, or irregular, or only involve the cornua. The external perichondrium may rupture, and the mucous membrane be torn, or only detached.

If the cricoid breaks only in one place, it is generally behind; if in several places, the fractures are scattered. The hyoid bone may give way in the body or at the cornua.* Healing occurs by fibrous union in the fractured cartilage. Portions of cartilage may be exfoliated. In some cases, whether of accidental or of suicidal origin, there may be accompanying lesions of the hyoid bone, trachea, jaw, clavicle, or neck.

* H. J. Davis, *Proc. Roy. Soc. Med.*, iii., Feb., 1910, p. 77.

Symptoms.—There are local pain, tenderness, and swelling, and more or less interference with respiration, phonation, mastication, and deglutition. Hæmoptysis may occur. Pain is elicited by movement and swallowing, and by handling the neck. Dyspnœa may be marked, and asphyxia by sudden stenosis may occur early. Asphyxial symptoms may come on later, or even develop suddenly in those who appear quite convalescent. The dyspnœa in such cases is probably produced by displacement of a piece of cartilage, or by sudden emphysema.

Emphysema of the neck, a very serious symptom, is likely to supervene, and the air may expand the cellular tissue of the neck and extend to the face, thorax, back, arms, and abdomen.*

Ecchymoses over the larynx are sometimes found, but external signs are often very slight. Manipulation may show displacement, mobility of the fragments, and crepitus. It is difficult to detect crepitus, and in any case it must be distinguished from a roughness which is felt when the normal larynx is moved from side to side over the cervical spine.

Laryngoscopic examination may reveal swelling, congestion, or hæmorrhage, and possibly show to what extent respiration is interfered with.† Acute œdema and hæmatoma in the inside of the larynx, with transitory immobility of the vocal cord, may follow an external kick.‡

Diagnosis.—In many cases it is difficult to diagnose a fracture where there is no displacement. Ecchymoses and pain are not sufficient to form a diagnosis; hæmoptysis is an important indication, the laryngoscope may reveal displacement, external deformity would confirm it; the elicitation of crepitus is positive. A skiagram should be taken in all cases, and will generally reveal the fracture. If a doubtful case cannot be kept under immediate skilled observation, it is safer to treat it as a case of fracture.

Prognosis.—The prognosis is generally grave; recorded cases show a death-rate of 70 to 80 per cent.§ Fracture of the thyroid cartilage is a more serious accident than when the hyoid is injured, and fracture of the cricoid appears to have been fatal in every recorded case, doubtless from the consequent subglottic infiltration. The prognosis is rendered much more grave when the case is complicated, as, for instance, by the presence of more than one laryngeal fracture accompanying fracture of the jaw or suicidal wounds.|| Antiseptic

* C. O. Hawthorne, *Journ. of Laryngol.*, xx., 1905, No. 4, p. 195.

† Chichele Nourse, *ibid.*, xx., 1905, No. 4, p. 194.

‡ F. Semon, *Proc. Laryngol. Soc., London*, i., Dec., 1893, p. 45.

Walker Downie, *Laryngoscope*, xxii., 1912, No. 9, p. 1119.

W. M. Mollison, *Proc. Roy. Soc. Med.*, Laryngol. Section, vi., March 7, 1913, p. 120.

J. Galbraith Connal, *Journ. of Laryngol.*, xxix., Aug., 1914, p. 438.

§ Durham, Holmes's "System of Surgery." (53 deaths in 69 cases.)

|| J. E. Platt, *Med. Chron.*, Dec., 1899; and *Practitioner*, July, 1900, p. 97.

precautions, and more prompt recourse to operative measures, have reduced the mortality from 78·7 per cent. to 27 per cent.*

The causes of death may be sudden cardiac inhibition, obstructive asphyxia, spasm, shock, emphysema of the mediastinum, bronchopneumonia, and septicæmia. Even in cases which recover the patient may be left with stenosis, requiring treatment or the permanent use of a tracheotomy tube. It is possible, however, that statistics drawn from recorded cases may give an exaggerated idea of the gravity of the accident, as in other instances the fracture may pass unrecognized during the lifetime of the patient. Evidence of old fractures of the hyoid bone or the laryngeal cartilages has been found in 9 out of 100 bodies examined in the dissecting-room.†

Treatment.—The chief danger lies in the interference with respiration. If this is met by an early performance of tracheotomy, there is no reason why a much larger proportion of cases should not recover. Some writers recommend a tracheotomy in all cases. It should certainly be done if there is any trace of subcutaneous emphysema, and the onset of dyspnœa should not be awaited before resorting to it. A fatal attack of suffocation may occur suddenly, so that no patient should be left beyond the reach of prompt assistance.

Intubation has been recommended as suitable in these cases; but when the cartilages are much crushed it would be safer to lay open the larynx by laryngo-fissure (p. 788), after a preliminary tracheotomy, and endeavour to replace the fragments in position before inserting an intubation tube, to act as an internal splint.

Injections of morphia, the application of ice to the neck, and scarifications of the vestibule of the larynx may be called for.

HABITUAL DISLOCATIONS OF LARYNGEAL ARTICULATIONS

(a) DISLOCATION OF THE CRICO-THYROID ARTICULATION

The rare condition has been described in which the inferior cornu of the thyroid cartilage is displaced forwards from the articular facet on the cricoid. This luxation occurs on deep inspiration or on gaping, especially when in a constrained position. It is generally unilateral, and may occur repeatedly for days together, or only at intervals of many weeks. When it takes place there is local pain and a slight swelling, with some feeling of anxiety. The swelling disappears at once, and the displacement is reduced by slight pressure with the finger or even by making a swallowing movement. Hence no medical treatment is necessary, as the patient is always able to reduce the dislocation himself. This luxation is

* G. Vitalba, *Boll. delle Mal. dell' Orecchio*, Firenze, xxviii., 1910, No. 3, p. 52.

† Arbuthnot Lane, *Path. Soc. Trans.*, xxvi., 1885, pp. 82-85.

attributed to contraction of the muscles attached to the thyroid cartilage—the sterno-thyroids and crico-thyroids. It is predisposed to when the capsule of the joint is loose.*

(b) DISLOCATION OF THE CRICO-ARYTENOID ARTICULATION

The arytenoid cartilage may be displaced from its articular surface on the cricoid. This may occur alone or be associated with ankylosis.

Very few cases have been observed.

The joint is an important one, as it is kept in constant motion throughout life by the movements of respiration. The most marked movement is in phonation, and it might be expected that displacement of this joint would cause much impairment of the voice. But if only one side is affected this is seldom noticeable, owing to the compensatory action of the opposite cord.

The **causes** may be traumatic, pathological, or congenital. Traumatic dislocation by a cause acting from without must be very rare. It is reported to have been produced by muscular action in vomiting. Pathological luxations have been observed during syphilis, tuberculosis, enteric fever, variola, and diphtheria. Some dislocations are apparently congenital.

Symptoms are occasionally absent, and the condition is discovered by accident. At times dyspnoea occurs, especially during temporary inflammatory attacks. The voice is generally unaltered, but may be hoarse or falsetto. Pain on swallowing is only noticed during the acute stage. On examination, the arytenoid cartilage, with the ary-epiglottic fold, is seen hanging over and partially concealing the posterior part of the glottis. The corresponding vocal cord is generally fixed in the middle line, or between that and the cadaveric position. Some adduction may be seen on phonation.

The apparently increased size of the arytenoid must not be mistaken for a new growth, neither must the fixation of the cord be misinterpreted as due to paralysis.

Treatment.—Reduction of the displacement by manipulation does not hold out much prospect of success. Besides, many cases are combined with ankylosis. The application of the faradic current to the posterior wall of the larynx may be tried, and in the event of dyspnoea recourse to tracheotomy may be necessary.

* B. Braun, *Berl. klin. Woch.*, Oct. 13, 1890.

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- P. Tetens Hald, *N.Y. Med. Rec.*, June 2, 1906.
Hirschmann, *Arch. Internat. de Laryngol.*, xv., 1902 No. 5, p. 332.

CONGENITAL GLOTTIC STENOSIS

Synonyms.—*Webs of the larynx*; *pseudo-membranous stenosis*; *diaphragms of the larynx*; *congenital laryngeal stenosis*.

Definition.—This is a rare condition; a case published by Semon in 1898 was the sixteenth placed on record,* Fein has been able in only 11 recorded cases to satisfy himself that the condition was congenital.† According to recent writers only about 20 such cases are on record.‡ Two have since been added by Emil Glas,§ and one by G. Kiaer.||

Etiology.—From an observation of Seifert it would appear that this condition is almost certainly congenital.¶ In cases where the symptoms only develop in adult life the condition may be due to syphilis or traumatism (Plate xvi., Fig. 6, facing p. 500).

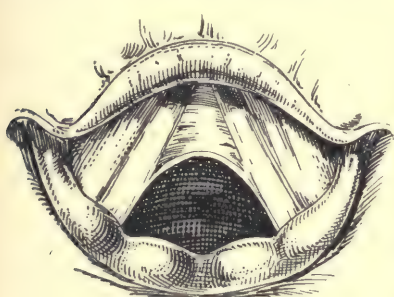


Fig. 225.—Congenital laryngeal diaphragm, as seen during deep inspiration. (Emil Glas.)

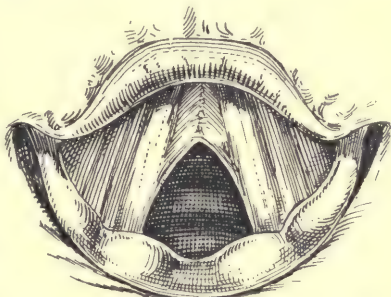


Fig. 226.—Congenital laryngeal diaphragm, as seen during quiet respiration. (Emil Glas.)

Symptoms.—Stridor, chiefly inspiratory, will be noticeable at or soon after birth, associated with dyspnoea on exertion, and other symptoms somewhat similar to those described under Congenital Laryngeal Stridor (p. 474); but the cry will be more or less hoarse, and, when speech develops, the voice will be harsh and weak.

Examination shows the web stretching across the anterior commissure from one cord to the other. It is symmetrical, somewhat translucent and membranous-looking, and in some instances slightly pink. On phonation it is folded between, below, or above the two cords (Figs. 225 and 226). A suggestion of this condition is sometimes indicated by a rounding of the ordinary acute angle occasionally seen in the anterior commissure. In some cases, again, a small fold of membrane is seen anteriorly in the subglottic region, entirely uncon-

* *Brit. Med. Journ.*, 1898, i., p. 1373.

† *Wien. klin. Rundschau*, Dez. 27, 1903, No. 52.

‡ Hausberg, *Zeitschr. f. Laryngol.*, Bd. i., Heft 1, 1908, S. 61.

§ *Laryngoscope*, xviii., 1908, No. 7, p. 564.

|| *Wien. klin. Woch.*, xxi., 1908, No. 16, S. 603.

¶ *Berl. klin. Woch.*, 1888, No. 10.

nected with the cords. This apparently causes no symptoms. In only two or three recorded cases did a web occupy the posterior region of the larynx (Chiari).

Pathology.—Chiari, Harmer and Fein, have demonstrated a few layers of pavement epithelium, cornified in places, on a stroma of connective tissue, traversed by capillaries.

Treatment.—The slighter forms should be left alone. When interference is called for on account of much voice impairment, stridor, or dyspnoea, it is well to remember that many of these webs have proved to be extremely tough. Their removal may require the galvano-cautery, as well as intralaryngeal knives and forceps, followed by the use of intubation tubes. Thyrotomy (i.e. laryngo-fissure) is not always successful, as the raw anterior extremities of the cords are apt to grow together again. (For further treatment, *see* Stenosis, p. 574.)

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 G. W. Badgerow, *Proc. Roy. Soc. Med.*, Laryngol. Section, Jan. 10, 1913, p. 66.

CONGENITAL LARYNGEAL STRIDOR

Synonyms.—*Infantile respiratory spasm*; *congenital laryngeal obstruction* (Sutherland and Lack); *respiratory croaking in babies* (Gee); *infantile laryngeal spasm* (Goodhart); *clonic spasm of the glottis* (Löri); *posticus paralysis of infants* (Robertson); *stridulous respiration of the newly-born* (Comby); *congenital laryngeal stridor* (Rocaz, Suckling, Stamm, Merklen, and Devaux).

Definition.—A rare form of laryngeal stridor commencing at or soon after birth, generally disappearing in the course of development during the second year, and seldom met with after the third year. This affection is probably often unrecognized. It has frequently been confused with laryngismus stridulus, although it has characters sufficiently distinctive to differentiate it easily. Its pathology has only recently been established by the help of direct laryngoscopy.

Etiology.—It is difficult to determine any predisposing circumstances, and this point helps to distinguish the affection from the laryngismus stridulus for which it is often mistaken. The general health of the patients, as a rule, is good, and neither rickets nor digestive troubles have been marked concomitants. It is said to be more frequent in male infants.

Pathology.—At least seven hypotheses have been advanced to explain the origin and cause of this singular disease. They may be tabulated as follows:—

1. A neurosis. A defect in development of the cortical respiratory centres leading to glottic spasm and inco-ordination, which

has been compared to stammering (John Thomson, McBride, Ashby, Stamm, Herzfeld).

2. Inco-ordination of the respiratory movements, possibly due to some developmental backwardness of the cortical structures which control them, resulting secondarily, by aspiration, in an exaggeration of the normal infantile type of larynx (John Thomson and Logan Turner). (Fig. 36, p. 43.)

3. Muscular spasm (Variot, Löri, Goodhart).

4. Reflex irritation from adenoids (Eustace Smith).

5. Paralysis of the abductor muscles, i.e. the crico-arytenoidei postici (Robertson).

6. Compression from hypertrophied thymus gland (Avellis).

7. Congenital malformation of the vestibule of the larynx (Variot [his later view], Bruder, Sutherland and Lack, Cautley).

All but the last of these are only of historical interest since the introduction of Killian's direct laryngoscopy.

Adenoids are absent in most cases, and the presence of these growths can hardly be looked on as an essential causative factor.

Symptoms.—The stridor, which is the most characteristic feature of the affection, is usually noticed at or soon after birth. It has been reported as occurring as late as the third week of life, but in such instances a slight amount of difficulty in breathing was probably overlooked earlier. It is, as a rule, only on account of the stridor that advice is sought, and in a large number of cases the patients appear to be in good health, and many even seem to suffer no inconvenience from the stridor.

The character of the sound varies. It has been described as similar to grunting, the purring of a cat, sobbing, hiccough, or the croaking of a frog. It has been compared to the clucking noises made by a hen or chickens, and is often stated by mothers to be like croup. "Inspiration begins with a croaking noise and ends in a high-pitched note; expiration is accompanied by a short croak when the stridor is loud, but at other times it is noiseless" (John Thomson). Inspiratory stridor is always much louder than expiratory. The degree of stridor diminishes in proportion to the regularity and shallowness of the breathing. In most cases there are periods of complete intermission. When the child is asleep, being nursed, or with the head low, the stridor tends to diminish. On the contrary, whenever the child is awakened or taken into a cold atmosphere, or when he is hurried or stimulated, it tends to increase. Hence it becomes more marked when the child is awakened, is taken out of doors, when placed in a cold bath, when coughing or crying, and when frightened, or fed too quickly. It continues when the nostrils are pinched, and also

during yawning or anæsthesia. There is no hoarseness in the cry or cough.

With this stridor there is retraction of the thorax and abdomen, in all except the slightest cases. It varies in degree with the stridor, and, like it, may intermit. The retraction takes place in the usual situations, and if the stridor lasts some time the form of the chest is altered as in nasal obstruction with rickets (cf. p. 92). Working of the *alæ nasi* is not a marked symptom, although it is seen in severe cases.

In spite of these indications of obstructed breathing, cyanosis is not a frequent result, and in numerous cases is entirely absent.



Fig. 227.—Congenital laryngeal stridor.

Larynx from Refslund's case in a child aged 2½ months, who died of pneumonia. (*H. Refslund, Münch. med. Woch., 1896, No. 48.*)

It may accompany the attacks of aggravated stridor, but persistent cyanosis is very rare. Examination of the chest shows that the lungs are imperfectly expanded, especially towards their bases, where moist sounds and rhonchi are sometimes audible.

Examination.—Thanks to direct laryngoscopy, we are now able to inspect the larynx in the youngest infant (p. 46). Six cases of congenital laryngeal stridor were examined, by the indirect method, by Lack, who gives the following as the characteristic appearance

met with: "The epiglottis was sharply folded on itself, the two lateral folds being in close apposition, and in some cases in contact. The aryteno-epiglottic folds were approximated, and thus the upper aperture of the larynx was reduced to a long narrow slit. The thin folds bounding this aperture seemed quite flaccid and flapped to and fro on respiration. The inspiratory column of air striking down on these folds drove them together, and on expiration they again separated. In some cases, the 'purring' ones, the coarse vibration of these cords could be distinctly seen. In only a few of the cases could a view of the vocal cords be obtained. They appeared quite white and normal, as the symptoms would have led one to expect." * (Fig. 227.)

By means of direct inspection D. R. Paterson † and A. Brown

* G. A. Sutherland and H. Lambert Lack, *Lancet*, Sept. 11, 1897.

† *Brit. Med. Journ.*, Nov. 24, 1906, p. 1447.

Kelly * have demonstrated that the larynx, as seen clinically, is of an exaggerated infantile type. The epiglottis is very long and tapering, and its lateral margins are rolled backwards so as to meet, and thus form a complete cylinder above. The greatly reduced entrance to the larynx is bounded by the ary-epiglottic folds, which are too closely opposed to admit any but the slightest amount of air. The croaking noise is caused by the free and unsupported part of the posterior laryngeal wall and neighbouring loose tissue on the summits of the arytenoids, which is sucked forwards and inwards during inspiration.

Post-mortem examinations by Lees,† McIlraith,‡ Cautley,§ Variot,|| Henry Ashby,¶ Koplik,** and others, have corroborated these observations. It remains to be settled whether the narrowing of the laryngeal orifice is primary or secondary.

Rocaz states that with the disappearance of the bruit the epiglottis is gradually unrolled.†† Sutherland and Lack acknowledge that as the child grows the stridor disappears, but the malformation remains. They explain this by the fact that the parts forming the upper portion of the larynx become less yielding. It has been objected that the condition described by Sutherland and Lack is nothing more than the normal infantile type of larynx, but Lack asserts that he has frequently examined the larynx in children and has never observed the malformation described except in association with this affection.

Progress.—As already mentioned, this peculiar stridor tends to disappear during the second year. It may have increased for some weeks or months after its first appearance, and then it tends to diminish gradually. After the end of the second year, it is occasionally elicited, in a slight degree, when there is any demand for a hurried or deep inspiration.

Diagnosis.—This affection must be diagnosed from laryngismus stridulus, ordinary laryngitis, true croup (laryngeal diphtheria), and growths in the larynx—the most usual in infants being papillomata. Direct inspection of the interior of the larynx, when available, is the promptest method of settling the diagnosis (p. 46). Assistance can be obtained from bearing in mind that congenital laryngeal stridor commences early, and is not sudden and acute

* *Brit. Med. Journ.*, Sept. 26, 1908, p. 895.

† *Trans. Path. Soc., London*, xxxiv., 1883, p. 19.

‡ *Med. Press*, May 2, 1900, p. 447.

§ *Reports of the Society for the Study of Diseases in Children*, London, vi., p. 231

|| *Journ. de Clin. et de Thérap. Infantile*, 1898.

¶ *Brit. Med. Journ.*, Nov. 24, 1906, p. 1488.

** *Arch. of Pediatrics*, Dec., 1905.

†† *Revue Mensuelle des Maladies de l'Enfance*, xx., Fév., 1902, No. 2.

in its onset; that the characters of the stridor are peculiar, and that it is accompanied by certain evidences of obstructed respiration. The stridor does not render the cry hoarse, does not appear to cause marked general symptoms, and occurs throughout the day, and even at night, with short intervals of quiet breathing. The croak is of a lower pitch than the crow of laryngismus. The general health is good, and there is no fever.

In cases of tracheal obstruction, as, for instance, from pressure of an enlarged thymus, expiratory stridor may be more marked than inspiratory stridor, and may exist alone.

Prognosis.—As in many similar conditions, the obstruction to the breathing may lead directly to death from suffocation. This is not a common occurrence, and threatening symptoms generally increase slowly or are induced by the occurrence of complications such as laryngitis and bronchitis. If the interference with respiration is moderate in amount, the prognosis is favourable, provided the infant's general health is well maintained, since, as a rule, it passes off by the end of the second year.

Treatment.—In all cases it will probably be wisest to limit treatment to efforts to maintain the general health and improve hygienic surroundings. Careful dieting and regulation of the digestion, possibly the administration of cream, maltine, or cod-liver oil, and prompt attention to any catarrhal developments, will be the chief indications. When cyanosis appears, or suffocative attacks become threatening, the question of tracheotomy or intubation must be considered, and if necessary performed, unless the patient is in such circumstances that it can be carried out at any moment if called for. These are last resources, and I have never heard of their being required. After excitement or anæsthesia any increased dyspnœa will be relieved by placing the child well over on its side and drawing the tongue forward. Inhalation of oxygen might be helpful.

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 Moscosco, Thèse de Paris, 1909; and *Journ. of Laryngol.*, xxvii., 1912, No. 1, p. 66.
 Other references will be found in the articles by Sutherland and Lack, and by John Thomson and Logan Turner.

CHAPTER XXXV

LARYNGITIS

ACUTE LARYNGITIS

Synonyms.—*Acute inflammation of the larynx ; cynanche laryngea ; angina laryngea ; acute catarrh of the larynx.*

Definition.—An acute catarrhal inflammation of the mucous membrane of the larynx, characterized by hoarseness or aphonia, and occasionally by cough. When uncomplicated it is without danger to life, and subsides spontaneously in three to ten days.

Etiology.—Among the causes of this affection are those already enumerated as generally productive of catarrh (p. 104). The disease is more frequently met with in the months of winter and spring ; men suffer from it oftener than women ; and in the young the condition is so important, and presents so many special features, that it will be considered separately (p. 482).

Exciting causes.—Excessive and, more particularly, improper use of the voice will often induce an attack of acute laryngitis, and it may follow on the vomiting and retching of an alcoholic debauch, or an attack of sea-sickness, or passionate attacks of crying or sobbing.

Among traumatic causes are the passage of foreign bodies into the larynx, the clumsy introduction of instruments, the accidental irritation produced by powders or paints intended only for the pharynx, and bungling attempts to introduce the stomach-pump.

Acute laryngitis may occur in acute infectious fevers, such as influenza, measles, whooping-cough, smallpox, typhoid, and scarlet fever. I have seen it in an acute invasion of the larynx with tubercle. Acute laryngitis may be of septic origin, and is occasionally infectious. It may be directly excited by the irritant fumes of chlorine, bromine, iodine, and ammonia, or of sulphuric, nitric, or other fuming acids.

Pathology.—At first there is hyperæmia, with dryness from arrest of the mucous secretion. As this stage abates there is an increased flow of mucus mixed with the cast-off leucocytes. It is doubtful if actual ulceration is ever found as a result of a simple catarrhal process. The defects which are sometimes visible on the vocal cords are probably more apparent than real, and at most are only abrasions of the epithelial surface. The affection may be limited more particularly to one part of the larynx, receiving accordingly the name of epiglottiditis, arytenoiditis, or chorditis.

Symptoms.—Acute inflammation may primarily attack the larynx, whence it spreads downwards to the trachea and bronchi, and upwards to the nose. Frequently it is but an extension

downwards of acute catarrh of the nose or pharynx. More rarely acute inflammation first develops in the bronchi and then spreads upwards; while it is so uncommon for acute inflammation of the lungs or pleura to be found with a similar condition in the larynx, that the association can only be looked on as accidental. When the affection is due to the spread of inflammation from the nose or pharynx, the symptoms are ushered in with those of the primary affection. A feeling of chill, even a slight rigor, may mark the onset, but, generally speaking, the first symptom is discomfort in the throat, with dysphonia or hoarseness. The voice loses its tone, becomes hoarse, and sinks to a bass, though at moments a shriller or slightly falsetto note may suddenly be emitted. Complete aphonia may occur; and the voice is generally worse in the morning. Talking becomes very painful, and often excites uncomfortable attempts at swallowing the scanty mucus. Cough is not a usual symptom, and if present at this stage it is short, painful, and ineffective. There is no external tenderness, and firm grasping of the larynx often gives a feeling of support and comfort. There may be very little general disturbance, there is never high fever, the appetite is not completely lost, and the night's rest is rarely destroyed. But there may be slight feverishness, and in some cases considerable malaise.

At the end of twenty-four to forty-eight hours, relief is generally ushered in by free secretion from the mucous membrane of both the larynx and trachea. Hoarseness diminishes, speaking ceases to cause discomfort, and cough, if present, is no longer painful. If not previously present it is now started by the necessity of expelling the mucus or muco-pus. As this is expectorated, a sensation of rawness is generally referred to the front of the trachea. With restoration of voice, feelings of malaise begin to disappear, and recovery is complete in a few days.

Examination.—In the early stage of acute laryngitis the visible changes may be slight, and appear disproportionate to the degree of hoarseness and discomfort. The vocal cords may show no sign of inflammation beyond a slightly catarrhal surface. The rest of the laryngeal mucosa may be duskily injected, and a somewhat succulent appearance or a relaxed condition is common in the interarytenoid region. As the hoarseness increases the cords become tarnished, then injected, while their flat ribbon-like surface becomes rounded and has been compared to the shape of a soda-water bottle. In acute cases the cords may become not only pink, but so acutely injected as to assume exactly the same colour as the ventricular bands. The ventricular bands and ary-epiglottic folds are congested, and may be so swollen as to conceal the vocal cords

more or less completely. The inflammation may spread to the sub-jacent crico-arytenoid muscles, so that the cords fail to approximate completely on phonation, and aphonia is then more marked (Plate xv., Fig. 4, facing p. 468). In other cases approximation is interfered with by the swelling of the lax mucosa over the interarytenoid region. Hæmorrhage occasionally takes place in the submucous tissue, and blood, generally in small streaks only, may escape from the surface. This rare variety is called hæmorrhagic laryngitis.

The free muco-purulent secretion of the later stage is more apparent, as it comes from the trachea and wells over the interarytenoid region to pass into the œsophagus.

The epiglottis, particularly the upper portion, is not always involved. The inflammation is never limited to one side, and is generally symmetrical on both sides. It will, in most cases, be found extending to the nose, pharynx, and trachea.

As recovery takes place the cords become grey, and then resume their normal tint and form. Some paresis of the internal tensors may remain for a time, particularly in cases due to influenza, or where the voice is not sufficiently rested.

Diagnosis.—The comparatively sudden onset, the associated catarrhal conditions, the absence of any laryngeal growth, and the bilateral and uniform distribution of the inflammation will obviate any mistake in the diagnosis. Any decided elevation of temperature would be opposed to a diagnosis of simple acute laryngitis. The probability of a foreign body having entered the larynx should never be overlooked, and in cases which do not soon yield to treatment the diagnosis should be reviewed in regard to tubercle.

Prognosis.—Acute laryngitis is free from danger when it is a primary affection. Recovery takes place in three to eight days, or else the condition passes into a chronic affection. As a complication in infectious fevers or systemic conditions, and when occurring in the aged or broken down, it is of graver importance. Caution is required in giving an opinion as to what voice a patient with laryngitis can produce. At the beginning of an attack the singing-voice may be much hoarser than appearances would warrant. Towards its conclusion baritones and contraltos appear to be able to sing sooner than tenors or sopranos.

Treatment.—This should be (a) local, (b) general, and (c) preventive. Voice-rest is more important, and should be as complete as possible. Recovery will be more prompt if general rest is enjoined, and the patient kept warm in bed, in a freely ventilated room, and treated as directed for catarrhal fever (p. 107).

In the early stages there should be no attempt at direct medication of the larynx. A turpentine fomentation, cold compress,

Leiter's coil, or a mustard leaf may give relief if applied over the front of the neck. Sucking ice, or a lozenge of codeia (gr. $\frac{1}{8}$), heroin (gr. $\frac{1}{12}$), morphia (gr. $\frac{1}{4}$), or other sedative will generally ease the pain, relieve dyspnœa, and check restless cough. Free secretion of soothing mucus should be encouraged by inhalations of benzoïn, hemlock, hops, or chloroform (*see* p. 65, and Fig. 54, p. 66). Steam may also be obtained from a Siegle's spray and inhaled through the nose and mouth for a few minutes every hour or so. The days of the "steam tent" are long passed (*cf.* p. 66).

The sipping of hot milk mixed with a pinch of salt, or with Vichy, Vals, or Ems water; small doses of iodide of potassium, ipecacuanha, vinum antimoniale, or apomorphia (Formulæ 49 to 52); lozenges of morphia and ipecacuanha, will assist in developing the secretion of mucus in the second stage. When the acute stage is past, steam inhalations should be replaced by sprays of liquid vaseline, either plain or with the addition of menthol, camphor, eucalyptus; oil of turpentine, or oil of creosote (Formulæ 15 and 68). The patient should go out of doors as soon as possible, but should avoid vitiated air, and the resumption of the voice should be made with caution. Any remaining want of tension in the cords can be improved by the administration of strychnine, nux vomica, or the use of electricity or massage. As there is generally concomitant catarrh of the nose and pharynx, great relief can be obtained by using a warm alkaline nose-lotion. (*See* Acute Rhinitis, p. 125.)

Prevention embraces moderation in the use of alcohol and tobacco; the avoidance of dusty, crowded, and overheated rooms, and of misuse of the voice, and observance of the rules of hygiene (*see* p. 106). Locally, any chronic affection of the air-passages should be attended to.

ACUTE LARYNGITIS IN CHILDREN

Synonyms.—*False croup; spasmodic laryngitis of children.*

In addition to what has been said in the preceding section, the following points deserve attention in regard to the laryngitis of young subjects.

In childhood the larynx is not only absolutely smaller than in the adult, but it is relatively small in proportion to the development of other regions (Fig. 228). The cartilages are softer and more yielding; the mucosa is less closely adherent to the sub-jacent tissues, and, consequently, effusion and stenosis take place more readily. The lymphatic supply of the mucosa is richer, and hence acute laryngitis is more apt to be attended with sub-mucous infiltration, especially in the infraglottic region. The

nervous system of the child is more unstable, and it appears to be particularly sensitive when the larynx is involved. In consequence of these peculiarities, inflammation of the larynx is always a serious affection in childhood, and produces acute symptoms—dyspnœa, cyanosis, and tendency to spasm—more quickly than in adults.

The **symptoms** sometimes give rise to what has been called false croup. The child may appear quite well during the day, or be only affected with a slight cough, and yet towards evening, or during the night, dyspnœa may develop rapidly, and alarming symptoms of spasm set in within a few hours. From these paroxysmal attacks the affection is often spoken of as “spasmodic laryngitis.” In most cases the symptoms are connected with naso-pharyngeal catarrh, and are partly those of laryngismus stridulus.

The suitable **treatment** will be found under Acute Laryngitis (p. 481), and the chapter on Laryngismus Stridulus should be consulted (p. 507). Emetics are more useful than in adults, and a teaspoonful of vinum ipecacuanhæ will often remove a quantity of obstructing secretion. Hot applications over the larynx are very useful in children. A purge of calomel (gr. i-ii) is frequently indicated. The child may be placed in a hot bath to which a little mustard may be added. Some such mixture as Formula 49 or 50 will prove useful. Finally, it must be remembered that with children life is more readily threatened, so that the practitioner should be prepared for intubation or tracheotomy, though these measures are rarely required.

When the acute attack has passed off, attention must be directed to the upper air-passages, and enlarged tonsils or adenoids should be removed. The diet and hygienic habits of the child will generally require attention, and in many cases cod-liver oil, maltine, and some iron preparation will prove beneficial.

CEDEMATOUS LARYNGITIS

Synonyms.—*Laryngitis phlegmonosa*; *erysipelas of the larynx*; *œdema of the glottis*; *œdema glottidis*; *œdema of the larynx*.

Definition.—A certain amount of subacute or passive œdema is apt to occur in many of the ulcerative processes—syphilitic,



Fig. 228.—The larynx and trachea in the infant.

Sagittal section of the larynx of a male full-term foetus. Life-size. (From a specimen prepared by Mr. J. Ernest Fraser.)

tubercular, malignant,—as well as in connexion with other affections. But, as generally understood, the term is reserved for an acute œdematous infiltration of the introitus laryngis (vestibulum laryngis), more particularly of the arytenoid region and ary-epiglottic folds. It is an objective clinical phenomenon and not a disease, and is dependent on a variety of causes.

Etiology.—Acute œdema may be induced by the impaction of foreign bodies in the larynx; the inhalation of boiling steam or liquids (as when children drink from the spout of a kettle or tea-pot); the drinking of scalding or corrosive fluids; the inhalation of very irritating smoke or chemical vapours; or the injudicious or accidental application of caustics to the larynx. It may accompany the acute laryngitis of the infectious fevers—measles, scarlatina, diphtheria, enteric, erysipelas, and whooping-cough.

Inflammation in the neighbourhood of the larynx, as in malignant disease of the œsophagus, peritonsillar abscess, and inflammation at the base of the tongue, may lead to œdematous infiltration of the laryngeal mucosa. It may accompany Bright's disease, diabetes, cardiac anasarca, Quincke's œdema (angio-neurotic œdema, p. 737), and myxœdema (p. 736). It is sometimes produced by iodide of potassium, even by small doses in susceptible subjects, or in those affected with syphilis or laryngeal tuberculosis. A very serious form is that dependent on septic infection, and often met with in the course of Ludwig's angina, phlegmonous sore throat, erysipelas of the pharynx or larynx, and similar septic infections (p. 443). Œdema of the larynx has been met with in hydrophobia, and as an early complication of typhoid fever (p. 717). Sudden and rapidly fatal œdema may occur, though rarely, in cases of laryngeal tuberculosis, even when they are very slight.* Any growth compressing the tributaries of the superior vena cava, such as a goitre, bronchial glands, and mediastinal growths, may lead to passive congestion of the larynx.

Pathology.—The researches of Hajek † and Logan Turner ‡ have demonstrated that the mucous membrane is but loosely attached to the underlying tissue in the neighbourhood of the arytenoid region, the ary-epiglottic folds, and the ventricular bands. Hence infiltration takes place more readily into the areolar tissue of these regions than it does where the mucosa is closely attached, as over the epiglottis and vocal cords, where œdema is comparatively unknown. "Œdema glottidis" is a misnomer in the majority of cases. It is not the boundaries of the glottis but the aryteno-

* Logan Turner, *Proc. Laryngol. Soc., London*, vii., May 5, 1900, p. 97.

† *Langenbeck's Arch. f. klin. Chir.*, Bd. xlii., Heft 1.

‡ *Edin. Med. Journ.*, xi., May, 1902, p. 417.

epiglottidean folds that are the usual site of this condition (Fig. 229). Œdema of the larynx may not only occur primarily, but inflammation originating in the region of the tonsils may pass downwards to the glosso-epiglottic folds. Similarly, œdema of the lateral wall of the pharynx may spread to the pyriform sinus, and

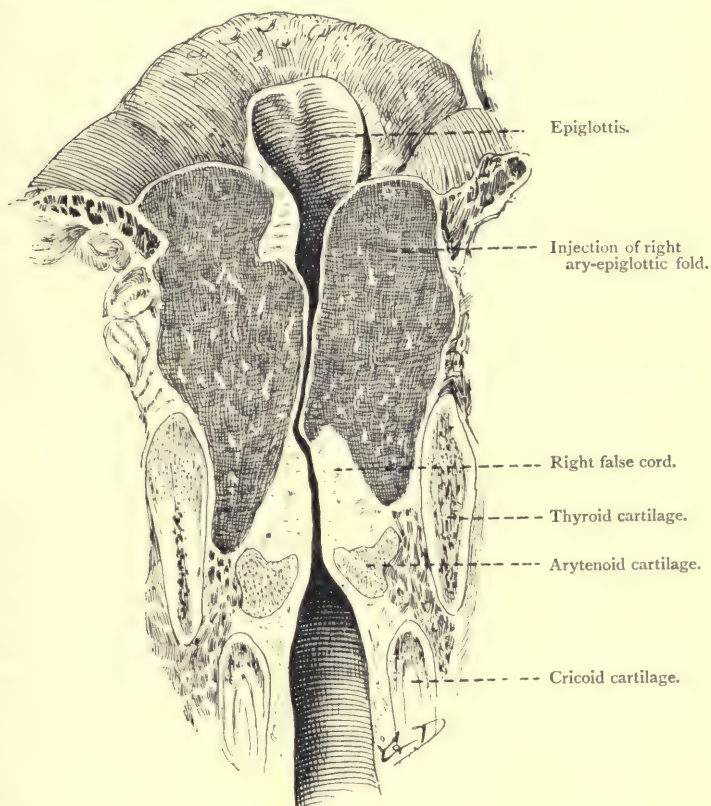


Fig. 229.—Œdema of the larynx. Coronal section of a larynx viewed from behind, showing the occlusion of the lumen which takes place from artificial injection of the ary-epiglottic folds.

The injection-mass occupies the ary-epiglottic folds, and fills up the sinus pyriformis. The two inner layers of the folds are so closely approximated to each other that the larynx is almost completely obstructed. They conceal from view the false and true cords, and the stenosis is further increased by the swollen ary-epiglottic folds causing a marked backward incurvature of the lateral margins of the epiglottis. (*A. Logan Turner.*)

from there reach the ary-epiglottic folds. In this way dyspnœa may supervene as a grave complication of faucial and pharyngeal inflammation.

The œdema may affect chiefly or entirely the subglottic region ;

its extension to the submucous tissue of the trachea is not common.

The exudation varies according to the cause and severity of the affection. In the passive form it may be entirely serous; but in the septic and inflammatory forms it is sero-purulent or purulent.

Symptoms.—In the chronic forms—those due to a passive œdema—the symptoms develop gradually. The patient has local discomfort and some dysphagia. Owing to the accumulated mucus and froth about the sinus pyriformis and base of the tongue, the voice becomes thick and hoarse. In the acute form the onset of the symptoms may be sudden and severe. If due to sepsis, they are often ushered in with a rigor. Dyspnoea is an early symptom, and stridor may become acute within a few hours or even minutes. The voice is reduced to a hoarse whisper, and there is great pain but little relief from attempts to clear the larynx of mucus, while much distress is occasioned by any efforts at swallowing it. The temperature is not necessarily raised; the pulse is small and quick; there is frequently great anxiety; and the face, which is bathed in clammy sweat, becomes congested, or pale and yet dusky.

Examination.—If a view of the larynx is obtainable, the most striking feature is the prominence of the large, sausage-like, œdematous swellings of the ary-epiglottic folds (Fig. 221, p. 445). These may be of a dull purple colour, or pale and somewhat translucent (Plate xv., Fig. 2, facing p. 468). They may be so large as to be compressed together and crowded against the epiglottis, leaving only a small chink, which is frequently occupied with frothy mucus. If the epiglottis is attacked it will be prominent, inflamed, swollen, semi-translucent, and somewhat globular or turban-shaped. If the subglottic region is involved, a smooth, uniform, red swelling will be seen below each cord. In most cases there will be superadded the symptoms of the causative conditions.

Diagnosis.—When the symptoms are sudden and acute, the large, pale, translucent swellings are typical of œdematous laryngitis. There is more difficulty if the history of the case is obscure, or if the condition is grafted on some chronic laryngeal condition such as tuberculosis.

Prognosis.—œdema in the larynx always causes anxiety, as it may unexpectedly increase suddenly, give rise to spasm, or cause sudden cardiac failure. In the later stages of tuberculosis and malignant disease it is of serious augury. It is one of the most fatal incidents in septic infection of the throat (cf. p. 443).

Treatment.—This will to some extent be guided by the discovery of the cause, and in all cases by the degree of obstruction. If moderate in amount, and not sufficient to cause marked laryngeal

stenosis, the œdema may be reduced by sucking ice and the application of ice-bags or cold-water coils to the neck. A laryngeal spray of 2 per cent. cocaine and 1-2,000 adrenalin can be used every hour. Hypodermic injections of pilocarpin (gr. $\frac{1}{8}$) have given good results. The œdema produced by iodide of potassium will disappear more quickly if bicarbonate of soda is freely given; in many cases its occurrence may be prevented by combining some tincture of nux vomica with each dose of iodide. If the œdema is more threatening, it should be reduced by freely scarifying the infiltrated tissues, previously cocainized, under the guidance of the laryngeal mirror. If the stenosis is very acute or the symptoms are threatening, tracheotomy should be performed. This should be done before stenosis is manifested by marked stridor, for then the tracheotomy may avert death from asphyxia but not from the cardiac failure which is so apt to be induced by acute obstruction. In all cases the necessity for tracheotomy may declare itself quite suddenly. The treatment of the primary septic form has been considered elsewhere (p. 446).

The œdema met with in the larynx in cases of angio-neurotic œdema (Quincke's disease) is described at p. 738.

MEMBRANOUS LARYNGITIS, NON-DIPHThERITIC

Synonym.—*Fibrinous laryngitis*.

Definition.—An inflammation of the mucous membrane of the larynx, accompanied by the formation of a membrane, and not caused by the Klebs-Löffler bacillus. It may be due to various other micro-organisms. It may be acute or subacute.

Etiology.—Except when of diphtheritic origin, a false membrane is rarely met with in the larynx. It may be caused by the application of strong caustics, traumatism, or the inhalation of boiling steam or irritating vapours. It may be of septic origin, and due to various staphylococci and streptococci, or the *Bacillus pyocyaneus*.* The membrane is similar to that met with in diphtheria, but is much less frequently found in the pharynx or nose.

Symptoms.—The chief symptoms are discomfort, hoarseness, and croupy cough. Dyspnœa may appear early in acute cases, but is seldom complained of when the membrane forms slowly. General symptoms will depend on the causative factor, but are seldom so marked as in diphtheria. In some cases the patient may continue to go about his work throughout the attack.

Examination will show the presence of a greyish-white or dirty-grey membrane. It will be found to be closely adherent to the mucous surface.

* J. W. Bond, *Proc. Laryngol. Soc.*, London. iv., June, 1897, p. 103.

Diagnosis.—This form of membranous laryngitis is distinguished from diphtheritic laryngitis by remembering that the latter, in the majority of cases, is associated with the presence of membrane in the pharynx as well as in the larynx; the Klebs-Löffler bacillus can be cultivated from a swab taken from the membrane; and there are constitutional symptoms which help in the diagnosis. When there is any doubt, it is safer to treat the case as if it were one of true laryngeal diphtheria (cf. p. 722).

Prognosis.—This will depend on the cause of the affection, the amount of constitutional reaction, and the degree of interference with respiration.

Treatment.—The treatment should be symptomatic, and conducted on the lines suggested in the section on Acute Laryngitis (p. 481). If respiration is seriously impaired, intubation or tracheotomy may be required.

CHRONIC LARYNGITIS

Synonyms.—*Chronic catarrh of the larynx; chronic inflammation of the larynx; chronic laryngeal catarrh.*

Definition.—A chronic catarrhal inflammation of the mucous membrane of the larynx, the chief symptoms being impairment and alteration of the voice.

Etiology.—Idiopathic chronic laryngitis, except in professional voice-users, is rarely met with. This may be accounted for by the protective arrangements in the nose and naso-pharynx (cf. p. 5), the slight vascularity of the vocal cords, and the scarcity of glands in the larynx.

Disorders of the nasal and postnasal cavities, and to a less extent of the pharynx and mouth, are the most potent factors in originating chronic laryngitis. This may be brought about by (a) direct spread of catarrh through continuity of tissue; (b) interference with the physiological functions of the nose; (c) the descent of septic and irritating matter into the larynx; (d) the hemming and hawking thus induced; (e) interference with the chief resonating cavities of the voice; and (f) the increased strain thrown on the laryngeal muscles.

Chronic laryngitis may be the consequence of chronic catarrh of the trachea and bronchi. It sometimes precedes the development of any physical signs of laryngeal or pulmonary tuberculosis. It may also be traceable to uncleansed or carious teeth; pyorrhœa alveolaris; any inflammatory or ulcerative processes in the mouth; gastro-intestinal, hepatic, cardiac, or renal defects; rheumatism, gout, asthma, or hay-fever. Cough, from any direct or reflex cause, will by itself induce a laryngeal catarrh. It has been traced to frequent fits of weeping. Excessive or faulty use of the voice is a potent factor in causation, particularly in those who are predisposed.

Chronic laryngitis may date from an acute attack. All ages are subject to this affection, although it is more commonly met with in adults. Men are more prone to it than women, but the latter are said

to be more liable to it during menstruation. An association has been traced between laryngeal affections and the sexual system.* Some drugs, such as arsenic, and particularly iodide of potassium, will produce laryngeal catarrh, and in sensitive subjects the inhalation of certain odours even is sufficient.†

Chronic laryngitis is nearly always present as a secondary phenomenon in association with laryngeal tuberculosis, lupus, syphilis, leprosy, paralysis, and neoplasms.

Other causes are mentioned under Acute Laryngitis (p. 479). The most common enemies of the larynx are dust, alcohol, and tobacco.

Pathology.—There is permanent hyperæmia of the blood-vessels from long-standing irritation. The epithelium may be abraded in parts. There is small-celled infiltration of the submucous tissues. In many cases there is a certain amount of myositis owing to the proximity of the intrinsic muscles of the larynx. The mucous glands are stimulated into increased secretion of a thick, tenacious mucus. The older authors described, under the title of "glandular laryngitis," a separate variety due to the special affection of the racemose glands. There appears to be no justification for this.

Symptoms.—The constant, and sometimes the only, symptom complained of is the alteration of the voice. This is at first intermittently husky, but in well-established cases the hoarseness becomes persistent. It is more marked after a rest, or on rising in the morning, and tends to disappear after a little use. The tone of the voice is lowered. Aphonia is seldom complete, except after prolonged or extreme forcing of the damaged organ. A sense of fatigue and soreness in the throat is complained of. Cough is not usual, though it may be started by efforts at talking. There is frequent hemming and hawking.

Abundant expectoration generally indicates that the trachea and bronchi are affected with the same catarrhal process. The alterations in voice are more noticeable in women and in tenor voices.

In a considerable number of cases the patient will also present symptoms of concomitant nasal or pharyngeal catarrh.

Examination.—The appearances in the larynx vary according to the severity, duration, and extent of the disease; but in all cases it should be noted that there is absence of acute inflammation, and that the changes are bilateral, and generally more or less symmetrical. The mucous membrane is congested, redder in females and in tenors, and darker and more purplish in basses and the more chronic cases. Pellets of thick mucus may be seen hanging about the posterior section of the larynx. The cords themselves in many cases are only slightly affected, having lost their clear, mother-of-pearl look, and appearing dull and dirty-grey. At

* F. Semon, *Brit. Med. Journ.*, Jan. 5, 1895.

J. N. Mackenzie, *Journ. of Laryngol.*, March, 1898.

† Joal, *Rev. Hebdom. de Laryngol.*, 1894.

other times arborescent vessels are seen ramifying on them. (In the normal condition no blood-vessels are to be seen on the vocal cords, in the same way, for instance, that they are met with on the epiglottis.) In the worst cases the cords may assume a dull, deep-red colour. Their upper surface is often rounded, instead of being flat and ribbon-like, and on phonation they may fail to approximate owing to a paresis of the internal tensors. Posteriorly, complete approximation of the cords may be prevented by a thickening of the interarytenoid area.

Shallow abrasions of the epithelial surface are sometimes met with, especially towards the interarytenoid region. Stoerk has described a fissure as particularly apt to occur amid the folds of this region when they are pressed together in phonation. During phonation it will also be noticed that the ventricular bands share in the general congestion, their thickness being due to a small-celled infiltration, or to muscular hypertrophy from vicarious action, the inefficacy of the true vocal cords being supplemented by forcible adduction of the ventricular bands. The ary-epiglottic folds share in the process, and the epiglottis shows increased vascularity and, sometimes, thickening of the petiolus.

Diagnosis.—The chronic nature of the complaint, the absence of constitutional symptoms, and the bilateral and generally symmetrical nature of the affection are usually sufficient to remove any difficulty in the way of diagnosis. As tuberculosis of the lung may be accompanied by a chronic and inveterate laryngitis (without visible tubercular deposit in the larynx), care should be taken to exclude the possibility of this affection by a careful examination of the chest, weight, temperature, and sputum.

Prognosis.—Frequently the affection shows little tendency to spontaneous recovery. The difficulty of securing rest to the voice, the unhygienic surroundings of the patient, the permanent defects in his upper air-passages, or faulty methods of singing or voice-production, may combine to keep up the condition.

There is no danger to life in the affection, and appropriate treatment will lead to recovery in a large number of cases, especially if the patient is able and willing to follow advice.

The practitioner should be warned against gauging the patient's vocal power entirely by the appearances of the vocal cords. A clear voice is dependent on so many factors that a genuine hoarseness may exist with a trivial or even imperceptible alteration in the vocal cords. On the other hand, it is remarkable how some men are able to talk, and some basses to sing, with an inflamed condition of the cords which would render women quite hoarse, and tenors quite songless.

Treatment.—Success in treatment will depend on the detection of the etiological factors, and these will generally be found outside the larynx. In a large number of cases—the majority, according to Bosworth*—treatment must be directed to the nose or nasopharynx. Examination of the digestive, renal, or uterine functions, or the detection of gout or rheumatism, may in some cases afford the chief indications for treatment. The habits of the patient may require attention as regards food, drink, clothing, sleep, exercise, tobacco, fresh air, and ventilation. When originating primarily in the larynx, it will generally be discovered that the laryngitis is attributable to faulty use of the voice.

In all cases the treatment should begin by resting the voice. Strict silence is desirable, and, if this is impossible, then shouting, speaking in the open air, lecturing in close, crowded, dusty or stuffy rooms should certainly be avoided, and whispering should suffice and be limited to the barest necessities of life.

When there is much secretion, treatment may be commenced by a cleansing alkaline spray (Formulæ 8 to 11). Antipyrin (gr. v to $\bar{3}$ i), menthol (gr. ii to $\bar{3}$ i), or carbolic acid (gr. ii to $\bar{3}$ i) may be added for their sedative action. Oily sprays, medicated with such stimulating oils as menthol, eucalyptus, oil of wintergreen, oil of cassia, or pine oil, have to a large extent superseded the steam inhalations which were formerly employed for carrying the essential oils into the air-passages.

In inveterate cases, astringents may be used, in the form of watery sprays, to which are added one or other of the following, namely, nitrate of silver (gr. ii–v), sulphate of zinc (gr. v–x), chloride of zinc (gr. ii–vi), perchloride of iron (gr. iii–viii), sulphate of copper (gr. iii–x to the ounce).

Massei recommends a 2 per cent. spray of lactic acid.

The laryngeal brush is seldom resorted to. It might be required in some inveterate cases, when we generally employ nitrate of silver solution, beginning with a strength of 5 gr. to the ounce, increasing gradually, according to the amount of reaction produced, up to 50 or 100 gr. to the ounce. The frequency must be proportionate to the local condition and to the reaction produced. There are few cases in which an application once a week is not sufficient. In chronic but less inveterate cases, chloride of zinc in the strength of 20–30 gr. to the ounce may be used. The application of fused nitrate of silver or chromic acid, incisions into the cords, and the intralaryngeal use of the galvano-cautery, are dangerous proceedings which are seldom called for.

Any remaining paresis of the cords may be met by the

* "Diseases of the Nose and Throat," 3rd ed., p. 625. 1897.

administration of strychnine, breathing and vocal exercises, the use of faradism, or a course of static electricity.*

For those who can afford it, any country air is better than the air of cities, but the high dry air of mountains is apt to be too irritating, and for an inflamed larynx it is better to choose milder and softer climates, such as those of the Riviera, Madeira, Sicily, or the south-westerly coasts of our own shores. There is some difference of opinion, and also of idiosyncrasy, in regard to sea-air, but strong wet winds are prejudicial, and the shelter afforded by woods is a distinct desirability. Elderly patients who are subject to winter attacks of chronic laryngitis should be recommended a change to a sunnier and warmer climate.

Many chronic cases of laryngitis can be relieved by a visit to such spas as Mont Dore, Eaux-Bonnes, Aix-les-Bains, Marlioz, Challes, Ems, or Cauterets.

LARYNGITIS SICCA

Synonyms.—*Chronic atrophic laryngitis; ozænatous laryngitis; ozæna of the larynx.*

Definition.—A chronic inflammation of the mucous membrane of the larynx, resulting in atrophy, and generally associated with the formation of crusts.

Etiology.—The disease is nearly always the result of purulent processes in the nose—suppuration in the accessory sinuses, ozæna, syphilis, purulent catarrh, and adenoids. It is started in the larynx either (a) by pus trickling into the larynx, (b) by the inhalation of pyogenic organisms from the nose, or (c) as a result of the mouth-breathing induced. It is more common in females. Occasionally it may be primary. It is made worse by the usual causes of chronic laryngitis, and particularly by a dusty atmosphere (cf. p. 488).

Symptoms.—The voice is hoarse, being worse in the morning or after working in dust-laden air. It improves on the expulsion of any crusts. This expectoration of dried secretion entails a great deal of painful hawking and coughing, and is sometimes accompanied by a little hæmoptysis due to the abrasion consequent on the separation of the sticky scabs. These have sometimes a very foul ozænatous odour. As the crusts re-form, the patient again becomes hoarse or aphonic, and experiences considerable pain in speaking.

Examination shows the atrophy and crusts which are characteristic of the disease. The crusts may be green, yellow, or blackish, and are most common in the interarytenoid region, the posterior ends of the cords and ventricular bands. They can often be seen

* J. Curtis Webb, *Lancet*, June 10, 1905.

in the trachea. When removed, the surface underneath them may be abraded. The tension of the cords is generally impaired. In the majority of cases the purulent discharge can be traced up to the postnasal space and into the nose.

Pathology.—The process begins from the mucous surface, which is first infected and then abraded. Many of the mucous glands are destroyed. The underlying tissue is replaced by connective tissue. There is anæmia from the constant presence of septic material, and atrophy from want of use of the muscles.

Prognosis.—The prospect of cure depends on the possibility of detecting and removing the infecting focus of suppuration.

Treatment.—Search must first be made for the etiological factor, and treatment directed accordingly. The possibility of a syphilitic diathesis, acquired or congenital, should not be lost sight of. Even if nothing points to specific disease, relief is frequently obtained from gently stimulating the atrophied laryngeal glands by administering small doses of iodide of potassium. The larynx should be sprayed or syringed out frequently with an alkaline solution (Formulæ 8 and 9, p. 801), and when cleared of crusts it may be lubricated with a spray of paroleine containing menthol or other antiseptics (Formulæ 66 to 69). A healthier condition of the mucosa may also be promoted by painting with some form of Mandl's solution (Formula 71). Lozenges, such as chloride of ammonium, tend to detach the secretion, and the trochisci acidi carbolici (Formula 43) are cleansing and comforting. If the mucous surface is abraded it may be occasionally painted with weak nitrate of silver. Dust, alcohol, and tobacco should particularly be avoided. A visit to the alkaline or sulphur spas of Ems, Mont Dore, Luchon, Cauterets, Aachen, or Harrogate will generally be found beneficial.

SUBMUCOUS HÆMORRHAGE

Definition.—An extravasation of blood below the mucous membrane, due to sudden strain. It must be distinguished from the oozing of blood called "hæmorrhagic laryngitis" (p. 481).

Etiology.—A submucous hæmorrhage is nearly always the consequence of some sudden vocal exertion, as in talking, singing, screaming, or even sneezing, but it may also result from the laryngeal strain involved in closing the glottis in order to lift a heavy weight.* These hæmorrhages may occur with trained singers, and in women are more apt to occur at the menstrual period.† The affection is rare.

* Georges Gellé, *Arch. Internat. de Laryngol.*, 1899, No. 3.

† J. Garel, *Ann. des Mal. de l'Oreille*, xxiv., ii., 1898, No. 10, p. 281.

Symptoms.—Sudden difficulty with the voice—slight hoarseness, local pain, and fatigue on speaking—occurs at once. Examination will reveal bright-red or purplish effusions of blood on one or both cords, more or less irregularly distributed, and appearing as if lying on the surface. The true condition is revealed when it is seen that the blood-clot is not dislodged by coughing or manipulation (Plate xvi., Fig. 1, facing p. 500). The effused blood passes through the usual stages of a subcutaneous hæmorrhage, becoming dark purple, blackish, brown, pale yellow, and then disappearing. In some cases a hæmatoma as large as a split pea may remain for some time on a vocal cord, resembling an ordinary fibroma, and even looking like a malignant growth* (Plate xviii., Fig. 4, facing p. 520).

Prognosis.—Recovery may take several weeks, but is generally complete, and no trace of the accident remains.

Treatment.—Rest of the voice is most important; if neglected, fresh submucous hæmorrhages may occur. Absorption may be promoted by sprays of chloride of zinc or other astringent (Formulæ 33 and 34). It is seldom that more active local measures are required; but if the hæmorrhages are of any size, organization might be stimulated with the fine point of a galvano-cautery, or the clot might be picked off with laryngeal forceps.

NODULAR LARYNGITIS

Synonyms.—*Singer's nodules; teacher's nodules; chondritis tuberosa; chondritis nodosa; trachoma of the vocal cords.*

Definition.—A form of chronic laryngitis, generally caused by faulty use of the voice, and characterized by localized thickening of the vocal cords.

Symptoms.—The symptoms are those of chronic laryngitis, and the chief are voice-fatigue and intermittently increasing hoarseness. At first a few days' rest will sufficiently restore the voice for work; but, if care is not taken, distinct "nodules" are formed, and the hoarseness is more or less permanent.

Etiology.—The condition is predisposed to by the same causes that encourage chronic laryngitis, but in all cases it is the over-use or the misuse of the voice which is the exciting cause. Among school teachers it is more common with those who have to instruct large classes of infants in a dusty room, situated near a noisy thoroughfare; but from the greater frequency with which it occurs

* F. Semon, *Ann. des Mal. de l'Oreille*, xxv., 1899, No. 3, p. 241.

F. Semon, *Proc. Roy. Soc. of Med.*, Laryngol. Section, Feb., 1909, p. 80.
Cyril Horsford, *Lancet*, July, 1908.

in young female teachers it would seem that such predisposing factors as anæmia and irregularities of digestion, or menstruation, play an important part. Any vocal strain, as in talking to the deaf, shouting in a noisy room or vehicle, or yelling in the open air, will bring on the condition. Nodules in singers are caused by a faulty method of voice production, particularly by attempting to sing in a register beyond the patient's powers, and by "squeezing" the voice. Hence they are met with more commonly in tenor and soprano voices, and are rarely if ever encountered in basses and contraltos. The method called the "coup de glotte" has been particularly blamed as a cause. Moure states that the condition is met with in children who join in part-singing and are forced to take a register beyond their natural compass.*

Pathology.—The hypertrophy is generally bilateral, although it may be more marked on one side than on the other (Figs. 230–233). It may affect the upper or the inner surface of the cord. It consists of normal stratified epithelium in the simple cases, in some instances with a small-celled infiltration of the sub-mucous layer; while many distinct "nodules" are found under the microscope to be œdematous fibromata.† In certain cases the inflammatory process is not limited to the mucous surface but entails a certain amount of myositis.‡

Examination.—There is more or less general laryngeal catarrh. In some cases the hypertrophy takes the form of a rounded eminence in the centre of the upper surface of the cord, as if a split hemp-seed had been inserted below the epithelial surface. The usual site is on the margin of the cord, and at the junction of the anterior and middle thirds. In an early stage, when the patient may only be complaining of voice-fatigue and occasional hoarseness, all that is visible may be a churning up of mucus at this point on phonation. Later on the cords lose their normally white surface, and become dull, slightly succulent-looking, and injected at this point. Finally, a nodule appears, generally on both sides, although it is frequently smaller on one side than on the other. This nodule may vary from the size of a turnip-seed up to that of a small pea. It is smooth, uniform, and slightly translucent, although a few vessels may be seen along its broad attached border, and by preventing coaptation of the cords it gives the toneless and hollow or harsh sound to the voice (Fig. 231).

* *Rev. Hebd. de Laryngol.*, xvii., 1896, No. 6, p. 146.

† J. W. Bond and StClair Thomson, *Proc. Laryngol. Soc.*, London, iii., March 11, 1896, pp. 66–67, 81–82.

‡ Kanthack, *ibid.*, iv., 1897.

Prognosis.—A nodule may develop within a few days, possibly as a result of a single musical performance, and may disappear as quickly, or may persist for months or years. Short periods of rest are followed by relief and retrocession of the symptoms. This is apt to encourage the patient to use the voice again; but if it is overused or misused, if local defects or injurious surroundings are still present, a recurrence generally ensues. With nodules large enough to be removed with forceps, a cure can often be more quickly effected than with minute thickenings just sufficient to mar certain notes. Such cases are the most difficult to treat, especially if the patient cannot give the required rest to the voice, or returns to a faulty method of voice production.

Treatment.—This should be similar to that indicated for

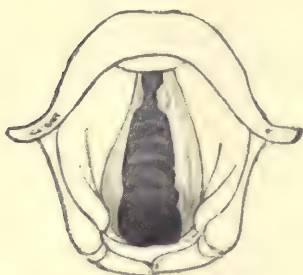


Fig. 230.—Singer's nodules.

Larynx in quiet respiration. Shows the nodules in the usual situation on both cords.



Fig. 231.—Singer's nodules.

The same larynx as shown in Fig. 230, during quiet and unforced singing. The voice was husky, diplophonic, and inclined to crack.

chronic laryngitis (*see* p. 491). Any general condition, such as anæmia, is treated on general principles. The most important measure is rest for the voice. Strict silence should, if possible, be insisted on, and it may require months of absolute dumbness in some cases before the nodules will completely disappear. Sometimes improvement is quicker if the "humming" exercises recommended by Holbrook Curtis are carried out.*

Before resuming professional use of the voice, any faulty methods of production should be corrected. When this has been neglected, I have known of singer's nodules recurring a second and even a third time after removal. If the circumstances of the patient make prolonged treatment impossible, or if the nodules are well marked, they can be removed with intralaryngeal forceps. If they are small and sessile, and if the practitioner possesses the

* "Voice-Building and Tone-Placing." New York, 1898.

necessary dexterity, the thickening may be touched with a fine galvano-cautery point.* It is well to notify a patient beforehand that the singing voice may remain unsatisfactory, even after a perfectly successful removal of the nodules, until a proper muscular tone has been restored by vocal gymnastic training.†

HYPERTROPHIC LARYNGITIS

Definition.—A form of chronic laryngitis in which there is thickening of the mucous membrane, more or less generalized.

Etiology.—This embraces all the causes already mentioned for chronic laryngitis (p. 491). The hypertrophic form is more apt to be met with when the chronic condition has been neglected for some time, and the use of the voice insisted on, or the external



Fig. 232.—Singer's nodules.

The same larynx as shown in Figs. 230 and 231, during forced singing. This thrust the nodules on to the upper surface of the cords, allowing them to come into apposition, and resulting in a clear, strong voice.

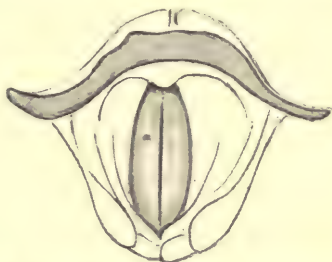


Fig. 233.—Singer's nodules.

The same larynx as shown in Figs. 230, 231, and 232, two months after I had removed both nodules with Mackenzie's forceps. (These four sketches were kindly made by my colleague, Mr. E. B. Waggett.)

conditions have not been removed. Hence it is very frequent in street-hawkers, salesmen, or those exposed to dusty occupations. It is not uncommonly due to prolonged irritation from nasal suppuration (p. 250). Chronic alcoholism is a factor in many cases. It is frequently met with in syphilitic subjects ‡ (p. 686).

Symptoms.—The symptoms are those of chronic laryngitis (p. 489), but the change of voice is more marked; there is less tendency to cough; and, although the condition is subject to acute or subacute exacerbations, the patient suffers less in using his chronically husky and toneless voice.

* A. Wylie, *Lancet*, Nov. 23, 1907.

E. A. Peters, *Proc. Roy. Soc. of Med.*, Laryngol. Section, Dec., 1910.

C. J. Koenig, *Arch. Internat. de Laryngol.*, 1910.

† Theodor S. Flatau, *Zeit. f. Laryngol.*, Bd. iii., Heft 4.

‡ Massei, *Ann. des Mal. de l'Oreille*, xxv., i., 1899, No. 2, p. 113.

Examination.—The laryngoscope reveals the conditions present in chronic laryngitis, and, in addition, the thickening which has occurred in the mucous and submucous lining of the larynx. This may be more or less uniformly distributed, but it is found most commonly in the interarytenoid space. Here it may stretch in a ridge from one arytenoid to the other, or be heaped up into one central mound, though, owing to the frequent approximation of the vocal processes in phonation, it is more commonly folded and so divided into three or more little hillocks. These are generally symmetrical, neither inflamed nor ulcerated, and the colour may be similar to that usually found in the interarytenoid space, or somewhat paler, or occasionally slightly darker. The surface may be rough, but is more or less uniform, and in many cases is coated with sticky mucus. When this overgrowth extends down to the level of the vocal cords it prevents the approximation of their posterior ends.

The ventricular bands are frequently so thickened as more or less completely to overhang and conceal the cords. This is particularly apparent on phonation; and some of this hypertrophy is doubtless muscular and due to an overaction of the bands to support or replace the inflamed or fatigued cords. The latter may be thickened and rounded, like a soda-water-bottle, and have lost their natural mother-of-pearl surface. The arytenoid regions are rounded, enlarged, and with the outline of their underlying cartilages obscured. The ary-epiglottic folds may be thickened. Hypertrophy of normal tissue is rarely noticeable on the epiglottis, but McBride says it may be found in gouty subjects and in those addicted to alcohol.*

Diagnosis.—It is important to distinguish simple hypertrophic laryngitis from (a) malignant disease, (b) syphilitic laryngitis, and (c) tubercular deposit.

(a) *Malignant disease* is never symmetrical, and is more localized; is of more rapid progress, and productive of more discomfort; the age and sex of the patient may give some indication, and the appearances are generally characteristic.

(b) *Syphilis*, when it attacks the larynx, very commonly leaves behind it a hypertrophic form of laryngitis which is sometimes difficult to diagnose, the more so as it often is little benefited by antisymphilitic treatment. It is frequently bilateral and symmetrical in its distribution, and its recognition may depend on the detection of some characteristic development of the disease, or trace of previous outbreak. Thus, any thickening, or scar, or loss of substance of the epiglottis would suggest syphilis, and it

* "Diseases of the Throat, Nose, and Ear," 3rd ed., p. 157. 1910.

might also be diagnosed by indications of previous outbreaks in the pharynx, tongue, nose, or elsewhere. Hypertrophic laryngitis is so frequently a legacy of syphilis that it is advisable to employ the Wassermann reaction in all suspicious or obstinate cases.

(c) *Tubercular infiltration* of the larynx without superficial ulceration may take place centrally in the interarytenoid space, or be so uniformly distributed over both arytenoid regions that its appearance may resemble that under consideration (Plate XXI., Fig. 2, facing p. 648). Of course, any break of surface of the deposit, or any one-sidedness in its distribution, would assist the diagnosis; discomfort in the larynx, or marked pallor of the mucous membrane, would also suggest tuberculosis and would direct attention to a careful investigation of the chest, sputum, temperature, weight, and family history. The difficulty is increased when we remember that pulmonary tuberculosis and simple or syphilitic hypertrophic laryngitis may coexist; but treatment of the lung claims first attention in any case, and will generally improve the condition of the larynx and so help to clear up the diagnosis.

Prognosis.—Recovery will depend on the possibility of detecting and removing the cause. Considerable improvement can be secured when the condition is due to other causes than syphilis. Treatment may entail prolonged rest to the voice, and a recrudescence can only be avoided by shunning any external irritating conditions. In certain cases some permanent impairment of voice is inevitable.

Treatment.—This is similar to that recommended for chronic laryngitis (p. 491). The treatment of the hypertrophic form has to be more persevering and more thorough. It is in this variety that the application of caustics, either fused on probes or on the laryngeal brush, finds its principal use, particularly when the chief site of the disease is the interarytenoid region. It is sometimes necessary to remove portions of the hypertrophic tissue. For patients who can afford it, the method of treatment carried out at Mont Dore, Cauterets, Harrogate, Ems, and similar health-resorts is particularly useful.

PACHYDERMIA LARYNGIS

Synonym.—*Laryngeal leukoplakia*.*

Definition.—A form of hypertrophic laryngitis characterized by more or less symmetrical thickenings over the posterior ends of the vocal cords.

* Gaston Poyet, "Leucoplasie Laryngée," *Ann. des Mal. de l'Oreille*, xxxvii., 1909, No. 7, p. 77.

Pathology.—Considerable attention has been given to this affection since its pathology was first fully described by no less an authority than Virchow, under the title of “pachydermia verrucosa laryngis.”* Possibly this has secured more interest for the condition than its importance warrants, for it is but one clinical form of the hypertrophic variety of laryngitis. The hypertrophied mass is formed of white or greyish-white thickenings which can be stripped off in layers, and is found to consist of epithelium thickened and undergoing epidermoidal changes. The subepithelial connective tissue is also thickened, and sends up papilliform processes into the epithelial layer. All degrees may be met with, from a slight thickening formed by some heaped-up epithelial cells, to an outgrowth of some size. Inflammatory changes may be observed in the thickened subepithelial connective tissue, but there is always a distinct line of demarcation between epithelium and connective tissue.†

Etiology.—This is not a common disease, being very rare in women and only occasionally met with in men between 30 and 60 years of age. Excess in alcohol and tobacco, as well as the usual causes of chronic laryngitis, is often blamed for it. But cases occur in which these factors are completely absent, and it does not even appear to be attributable to over-use of the voice.

Symptoms.—These vary to some extent with the size of the hypertrophy. I have discovered pachydermia in a patient whose voice was in no way abnormal. In some patients the larynx only gives trouble occasionally when inflamed. As the disease is limited to the posterior part of the larynx, and so does not interfere with the approximation of the greater part of the cords, it causes in the early stages a slight but variable amount of hoarseness. There is seldom much discomfort, although a patient may complain of a feeling as of a foreign body. In many cases the only complaint is of hoarseness, generally after prolonged or forced use of the voice. There may be a feeling of rawness and fatigue from the hemming and scraping required to expel the sticky mucus. In marked cases there may be dyspnoea on exertion. In 11 cases observed by Edmund Meyer, dysphagia was the most constant symptom, hoarseness being sometimes absent throughout.‡

Examination.—The laryngoscope reveals an almost typical condition of the posterior extremities of the vocal cords (Plate XVI., Fig. 2, facing p. 500). Situated over the processus vocalis on one side is an oval, grey or pinkish thickening, with a central depression which faces towards the opposite side. On the other vocal process is a second hypertrophy, also with its long axis in

* *Berl. klin. Woch.*, 1887, No. 32.

† Jobson Horne, *Journ. of Laryngol.*, xix., 1904, No. 9, p. 464; and *Proc. XVIIth Internat. Cong. Med.*, London, 1913, Part ii., p. 165.

‡ *Deut. med. Woch.*, 1890, No. 42.

Fig. 1.—Submucous hæmorrhage of the vocal cords. This occurred suddenly in a school teacher. (*See* p. 493.)

Fig. 2.—Pachydermia laryngis. (*See* p. 499.)

Fig. 3.—Tertiary syphilis of the larynx. The epiglottis had been partially destroyed in previous attacks. There is infiltration of all the tissues on the left side of the larynx. (*See* p. 687.)

Fig. 4.—Scleroma in the subglottic area. (*See* p. 711.)

Fig. 5.—Angioma (telangiectasis) of the larynx. (*See* p. 513.)

Fig. 6.—Webbing of the vocal cord in the anterior commissure, from syphilis, in a woman aged 71. (*See* p. 687.)

PLATE XVI.

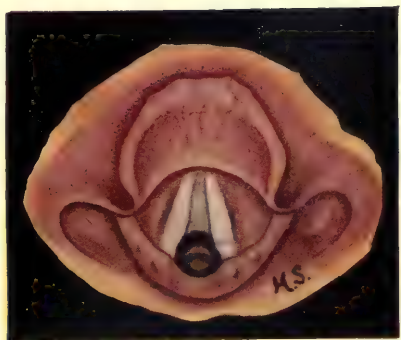
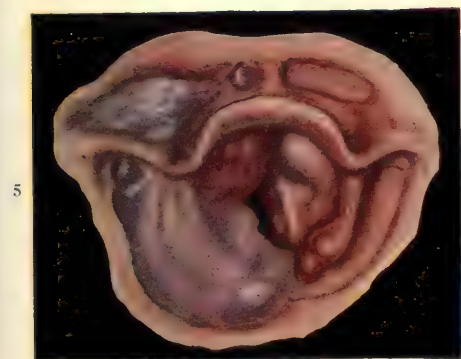
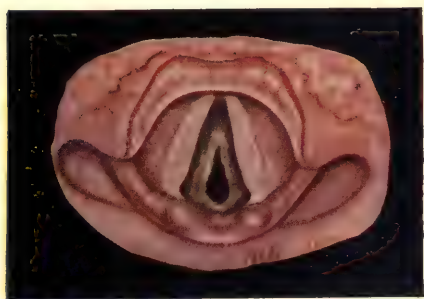


PLATE XVI.

that of the cord, and with a lateral apex fitting into the cup-like depression on the opposite side. These hypertrophies naturally interfere with the adequate approximation of the vocal cords, and may render the voice hollow or rough. Sometimes the opposing surfaces are both cupped, and then the approximation of the cords is rendered more possible, and there is consequently less interference with the voice. It was formerly thought that the depression on one side was caused by pressure from the hypertrophy of the opposite vocal process. A close examination, however, will generally reveal a depression on both sides, though more marked on that with the larger hypertrophy, so that the dimpling in the centre is probably due to the closer attachment of the mucous membrane at that point to the subjacent cartilage. The hypertrophies are uniform in shape, free from inflammation or ulceration, and are generally bathed in sticky mucus, which may stretch across in threads from one side to the other after the hypertrophic masses are pressed together on phonation, and then gape apart in inspiration (cf. Plate XVI., Fig. 2, facing p. 500). Sometimes they are so large as to appear almost pendulous. Occasionally the pachyderma is limited to one side, and then it generally produces an indentation on the opposite processus vocalis. In some cases there is accompanying hypertrophy of the neighbouring interarytenoid region. The movements of the cords may be somewhat impaired in abduction. In certain cases the usual symptoms of chronic laryngitis will be present.

Diagnosis.—This is based on the bilateral character and appearances of the thickenings; the history, the slow growth, and the crateriform depression. When the rarer condition occurs of one side only being affected, the suspicion of malignant disease may be aroused, though, if strictly limited to the area of the vocal process, the condition is more likely to be one of pachydermia than of epithelioma. A certain amount of impairment of the movement of the cord may also occur with simple hyperplasia. In doubtful cases it is wiser to reserve an opinion until the condition has been observed for some time, before removing a portion of the growth for microscopic examination. The diagnosis has in some instances to be made between simple pachydermia and that due to syphilis or to tubercle.

Prognosis is favourable as regards life, and continued, if impaired, use of the voice can generally be promised. The affection is very chronic, and not very amenable to treatment. In some cases improvement in the voice takes place owing to more complete invagination of one thickening into the other. There is no evidence that the disease is apt to assume a malignant character.

Treatment is not very satisfactory. The reader is referred to what has been said in the sections on chronic laryngitis, catarrhal and hypertrophic. The internal administration of iodide of potassium is generally recommended. Sprays or laryngeal washes of salt and water are sometimes helpful. Painting with nitrate of silver in increasing strengths here finds a suitable indication. Iodine has failed in the hands of Stoerk and Gottstein. Painting with lactic acid or salicylic acid in alcohol has been recom-

mended. The very tough pachydermic tissue may be removed by caustics, the galvano-cautery, or cutting instruments. Electrolysis has been advised by Chiari.* In case of pain, loss of voice, or dyspnœa, operation may be indicated, and removal of the thickened parts is usually successful, though Fraenkel in two cases saw obstinate ulceration and granulation follow the operation, requiring repeated applications of nitrate of silver.† Some writers hold that attempts at removal are liable to set up perichondritis, and I think it is much wiser to refrain from any active local interference. Sym-

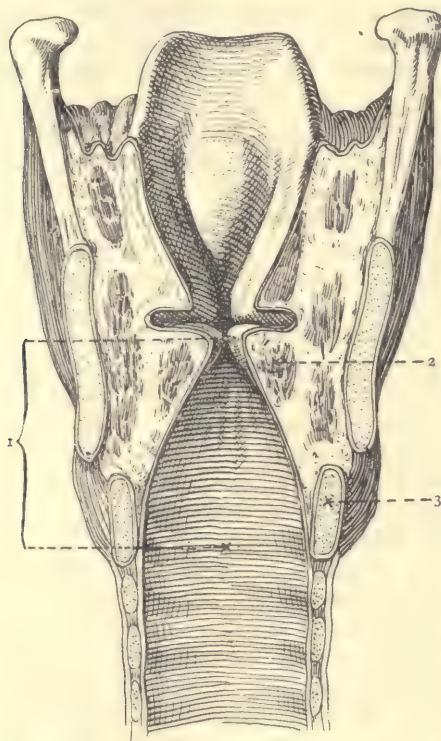


Fig. 234.—The subglottic region.

Anterior half of a coronal section of larynx and upper part of the trachea.

- 1, The limits of the subglottic region, i.e. from the level of the vocal cords to the lower margin of the cricoid cartilage; 2, the internal thyro-arytenoid muscle; 3, the cricoid cartilage. (A. Castex.‡)

toms of irritation or catarrh are treated as they arise, and the usual precautionary measures are taken against the attacks of acute or

* *Arch. f. Laryngol.*, 1894, Bd. ii., Heft 1.

† *Ibid.*

‡ *Bull. de Laryngol.*, tome i., 1898, p. 53.

subacute laryngitis to which these cases are often subject (*see* pp. 101 and 488). I have found most benefit from treatment of the general health, entire abstention from tobacco, and an occasional "cure" at some such spa as Harrogate, Caunterets, Mont Dore, or Ems.

CHRONIC SUBGLOTTIC LARYNGITIS

Synonym.—*Chorditis vocalis inferior hypertrophica*.

Definition.—A form of chronic hypertrophic laryngitis characterized by overgrowth or infiltration of the region immediately below the vocal cords (Figs. 234 and 235).

Etiology.—The causes, apart from those which are productive of hypertrophic laryngitis (p. 497), are not well understood. Misuse of the voice is not such an evident factor. It has been recorded as a sequela of enteric fever.*

Pathology.

The disease consists of chronic cell proliferation, both in the mucous membrane and in the submucous and muscular tissues. It may spread as far as the margins of the vocal cords, and gradually develop into an indurated mass.

Symptoms.

These are similar to those caused by chronic laryngitis (pp. 488 and 497). Dyspnoea, a metallic ring to the voice, and a short sharp cough, similar to that heard in tracheal obstruction, are more suggestive of the subglottic variety. Dyspnoea varies, but it is frequently sufficient to cause an

alarming sense of suffocation, and not infrequently requires active relief.

Examination.—Two rounded, uniform, symmetrical swellings are seen more or less closing up the glottic space below the level of the

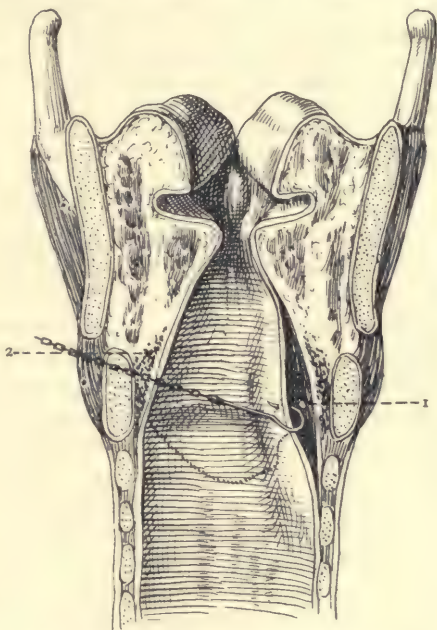


Fig. 235.—The subglottic region.

Posterior half of a coronal section of the larynx and upper part of the trachea.

1, The mucous membrane dissected and drawn inwards; 2, the cellular tissue which separates the mucous membrane from the perichondrium of the cricoid cartilage.

The mucous membrane in this region, particularly on each lateral wall, is easily detached. The cellular tissue below it is well marked, and here swelling readily occurs. The mucosa lining the trachea, on the other hand, is very adherent, and it is difficult to force injection fluid beneath it. (*A. Castex.*)

* Sokolowski, *ibid.*, 1894, Bd. ii., Heft 1.

vocal cords. The colour may be translucent greyish-white, and if touched with a probe the thickenings will sometimes be found to be œdematous. In other cases they are solid, and the colour varies from the dull pink of catarrh to the vivid red of congestion.

Diagnosis.—The affection, as a primary disease, is rarely met with. In many cases it is doubtless due to tuberculosis or syphilitic lesions. It has to be diagnosed from rhinoscleroma. The latter is a very rare disease in this country; it is accompanied and generally preceded by characteristic changes in the nose and pharynx; the growth is hard and cartilaginous to the probe, and under the microscope presents distinctive appearances (p. 711).

Prognosis—In common with other affections of the subglottic region, this form of chronic laryngitis is difficult to treat and is apt to encroach dangerously on the lumen of the air-passage. Its progress is chronic and its treatment unsatisfactory.

Treatment.—The plan of treatment recommended for chronic laryngitis should be followed with perseverance (p. 491). The stenosis may be met by the use of intubation tubes (p. 768). When the swellings are œdematous they should be scarified, and if the dyspnœa becomes dangerous, tracheotomy must be performed. Laryngo-fissure may be indicated.

PERICHONDritis OF THE LARYNX

Perichondritis is very rarely a primary disease. Acute perichondritis is almost always microbial, the micro-organisms gaining access by the blood- or lymph-channels, or through some slight breach of surface. (*See* Septic Inflammation of the Throat, p. 443.)

Etiology.—Perichondritis is nearly always secondary, and so frequently is due to syphilis (Plate xv. Fig. 4, facing p. 468), tubercle (Plate xxi., Fig. 5, facing p. 648), or cancer (Plate xviii., Figs. 5 and 6, facing p. 520) that any investigation of it involves a study of these three diseases.

The perichondrium is generally invaded by direct extension, but in syphilis and tubercle it may be the seat of the original deposit. Perichondritis also arises from traumatism, blows, stabs, and scalds, or the injuries caused by the passage of foreign bodies or rough morsels of food, or by their impaction in the larynx. It may be produced by wearing a tracheotomy tube in an opening made through the thyroid cartilage (Fig. 323, p. 782). It may be due to the spread of sepsis from the neighbourhood, or to acute infections, especially typhus, enteric, diphtheria, and smallpox. It occurs with the pressure of the dorsal decubitus in old people, and is said to be caused by gout.

Pathology.—Inflammatory exudation occurs between the perichondrium and the cartilage, going on to abscess formation, with necrosis and exfoliation of the cartilage. The abscess may discharge into the larynx, the pharynx, the trachea, or the œsophagus, or, more rarely, it may open on the outside of the neck.

In some cases, only an adhesive perichondritis takes place, resulting in inflammatory cicatricial tissue and considerable thickening.* The perichondritis is often undetected until suppuration and necrosis take place. The swelling and œdema may be so marked as to conceal the primary disease (Plate xv., Fig. 6), or it may bury from view the foreign body which started the trouble.

Tuberculous perichondritis chiefly affects the arytenoid cartilage, and may occur early in or around the crico-arytenoid joint. Here it may become organized and lead to fixation of the joint, or go on to suppuration and necrosis of the cartilage. (*See Tuberculosis*, p. 632.)

Syphilis, in the form of diffuse gummatous infiltration, is apt to occur on the inner surface of the alæ of the thyroid cartilage, producing a round swelling of the ventricular band or the subglottic region, pushing the vocal cord inwards, limiting its movement, and reducing the size of the glottis. It may remain more or less stationary, or induce fibroid induration, or break down (Plate xv., Fig. 4, facing p. 468, and Plate xvi., Fig. 3, facing p. 500). (*See Syphilis*, p. 687.)

Symptoms.—If acute, perichondritis may be ushered in with malaise, rigor, and the feverish symptoms of the primary infection. The local symptoms will vary very much according to the situation, severity, and extent of the perichondritis. The most characteristic are pain and tenderness; but there may be alteration in voice, cough, slight and slowly increasing dyspnoea, or dysphagia. A chronic abscess is revealed by the pus which may be seen recurring in the larynx. Bone and necrosed cartilage can occasionally be felt with the probe; crepitus is seldom discoverable. One or both vocal cords may be fixed, and a red, rounded, inflamed swelling will appear over the area of cartilage affected (Plate xv., Fig. 4, and Plate xvi., Fig. 3). The stenosis caused by a perichondritis may be due to several conditions, such as œdema, abscess, fixation of cord, impaction of necrosed cartilage, collapse of the laryngeal wall following exfoliation, or the subsequent retraction of scar tissue.

If the necrosed sequestrum is not exfoliated, purulent fistulæ, outside or inside the larynx, may continue for years, especially in syphilitic cases, causing pain, dysphagia, fetor, and cachexia.

Prognosis will depend on the cause. Perichondritis is always of serious import. In malignant disease and tuberculosis it is very grave. In syphilis the outlook is more hopeful, as it also is in trauma, if the foreign body can readily be removed. But if the sequestrum, in either case, is extensive the patient may succumb

* F. Semon, *Med. Times and Gaz.*, ii., 1880.

to chronic suppuration, exhaustion, or septic pneumonia. Death may also occur from the sudden bursting of an abscess. In all cases there is the prospect of the patient being left with an impaired voice and the dyspnœa of chronic stenosis.

Diagnosis is difficult in most cases, for a case must be far advanced before bare cartilage can be felt with a laryngeal probe. In tuberculosis there are, as a rule, other indications of the disease; but between syphilis and malignant disease the differentiation will require full consideration of the history, the effects of antisyphilitic treatment, the microscopical appearances, and the progress of the case. It is still more difficult if both diseases are present together in the larynx. As the laryngeal appearances resemble those of œdema (p. 483), this latter affection should always be viewed with the possibility of perichondritis in mind. The swelling and œdema may conceal a forgotten foreign body, and the use of the X-rays is then helpful.

Treatment will depend on the cause and the symptoms. In all cases it is well to order general and local rest. In acute cases, ice to suck, leeches externally, quinine, small doses of opium, and soft diet or rectal feeding may be indicated. A spray of cocaine (2 per cent.) and adrenalin (1-1,000) is ordered if there is œdema. When suppuration threatens, the outside of the larynx must be well fomented or poulticed, and the abscess incised, either internally with a guarded laryngeal knife, or from the outside.

Syphilis is so frequently at the root of suspicious cases that it is well to give iodide of potassium in all such instances, while in undoubtedly specific perichondritis treatment by inunctions or injections of mercury should be actively pursued (cf. p. 699).

A foreign body must be removed, either through the mouth, or by laryngo-fissure (p. 788), with or without previous tracheotomy. In tuberculosis and malignant disease we can only relieve symptoms. Tracheotomy will generally be required, and should be done as low as possible. We must be prepared for this operation in all cases of perichondritis; it is well not to defer it unduly.

CHAPTER XXXVI

LARYNGISMUS STRIDULUS

Synonyms.—*Adductor spasm; spasmodic croup; false croup; cerebral croup; asthma of Kepp; thymic asthma; child-crowing; spasm of the glottis; direct spasm of the glottis* (Goodhart and Still); *respiratory glottic spasm; spasm of the larynx in infants.*

Definition.—A form of laryngeal stridor in children, of sudden onset and without fever. It may be met with in the first month of life (Eustace Smith), and up to the eighth or ninth year, but usually appears between the fourth month and the end of the second year. It is more common in boys than in girls (Luc).

Etiology.—The affection is usually met with in congenitally feeble children, or in those who are the victims of improper diet or defective hygiene. Hence it is most commonly found in cases of rickets, and in those who are microcephalic or hydrocephalic. The exciting causes are traceable to some disorder of the upper air-passages or digestive tract. Among these the most frequent is naso-pharyngeal adenoids, but it may be some chronic nasal trouble, enlarged faucial tonsils, bronchial glands, or teething.* The irritant is frequently claimed to be intestinal worms. The affection may arise, particularly in the feeble, in the course of measles or whooping-cough.

Symptoms.—An attack of laryngismus most frequently occurs at night, and its onset is often comparatively sudden. The child may go to sleep as usual, and, with or without a little previous difficulty of breathing, he will suddenly waken struggling for breath. The breathing is of a metallic, croupy character, and the forced efforts at inspiration produce a crowing stridor. In the efforts to fill the lungs the patient sits up, tossing his hands about, holding to the nearest support or clutching his throat. All the accessory muscles of respiration are thrown into action; the mouth is open, the nostrils are dilated, the chest is heaving; but as all these efforts fail to fill the lungs, the diminished pressure causes retraction of

* Lubet-Barbon, *Rev. des Mal. de l'Enfance*, 1891, No. 9, p. 499.

Huber, *Arch. f. Pediatrics*, xi., 1894, p. 38.

Coupard, *Jahr. f. Kinderheilk.*, xxviii., S. 247.

the lower ribs and manubrium sterni. The expression is one of terror as the face becomes cyanotic, the head is thrown back, and perspiration breaks out. Respiration may even cease entirely for a few seconds, and if the paroxysm is severe there are carpopedal contractions, convulsions, opisthotonos, and even involuntary evacuation of urine and fæces. The attack lasts from fifteen seconds to two minutes. Generally, when the paroxysm is at its worst, one long, deep, relieving inspiration puts a termination to the distressing scene. But a croupy cough may continue for a time, and another attack may follow shortly, or later the same night, or recur every night, or only at some uncertain future date.

This severe type is not the most commonly met with, for the disease occurs with similar but much milder symptoms, which the parents often refer to as "passion-fits" or "holding the breath."

Throughout the attack expiration is not interfered with. As soon as the paroxysm is over the child falls asleep, and next morning is in its usual health, although a slight brassy cough may be left. If a successful laryngoscopic examination can be made during the interval, it is not likely that anything pathological will be found in the larynx itself.

Pathology.—The explanation of this affection has given rise to a good deal of speculation. It is often referred to as an instance of laryngeal "spasm," although the demonstration of spasmodic contraction of one group of laryngeal muscles is incapable of actual demonstration. Even if a laryngoscopic view of the larynx were possible during one of these attacks, the appearance of a closed glottis would not inform us whether this was due to spasmodic contraction of the glottis-closing muscles or to paralysis of the crico-arytenoidei postici. As opposed to the view of those who regard laryngismus stridulus as a spasmodic affection of the nervous system, allied to epilepsy or chorea, the explanation of Vivian Poore* and others, that the phenomena are due to the collapse of the soft tissues out of sheer feebleness, not only agrees with what we know of the affection, but also harmonizes with the treatment which is found to be the most successful.

The disease is nearly always found in patients who are flabby in their muscular system—the puny, sickly, and undeveloped. Their respiration is never very thoroughly carried on; and when now and again they feel the need of a deep breath, the diaphragm descends with extra force, the feeble crico-arytenoidei postici muscles do not contract with enough vigour to open the glottis proportionately, and consequently the soft parts are sucked together before the inrushing air current. In the subsequent efforts to take a

* *Med. Chronicle*, Nov., 1895.

full breath, the air imprisoned in the chest is absorbed, the blood becomes more venous, till at last it is so charged with carbonic acid as to stimulate the respiratory centre to act on the glottis-opening muscles, when the air rushes in through the widening glottis and the characteristic "crow" is emitted.

In many of these cases, if not in all (Eustace Smith),* there are naso-pharyngeal adenoids or other impediment to nasal respiration. In many such cases the instinct of nasal respiration is so marked that, even if the child has learned to breathe through the mouth during the daytime, he will go to sleep with the mouth closed. The instinct of nasal respiration will so assert itself that the patient will breathe, more or less successfully, through his nose until at last he is reduced to a half-oxygenated condition, when the hunger for air becomes so acute that a sudden and deep inspiration is drawn, and, in the child's half-asleep, half-asphyxiated condition, the larynx fails to open, just as in the stertor of chloroform anæsthesia. This condition of self-induced semi-asphyxia has been studied by MacDonald and C. A. Parker, and is sufficient to explain the convulsions without referring their pathology to the nerve-centres (p. 98).

This consideration of the explanation of laryngismus stridulus is not by any means merely academic or without practical importance, for upon the view adopted will depend the treatment. If the affection is regarded as a nervous, spasmodic one, the proper treatment would be the administration of antispasmodics, such as chloroform, chloral, bromide, and so forth. On the contrary, if the explanation here put forward is accepted, the tongue will be sharply pulled forwards as in chloroform stertor, the respiratory centres will be stimulated, and subsequently to the attack a tonic and stimulant treatment will be adopted.

Diagnosis.—As one of the names of this affection implies, it has sometimes been confused with true croup or laryngeal diphtheria. There need be no such difficulty in the diagnosis. The sudden onset, the absence of fever and hoarseness, the rapid subsidence of the paroxysm, and the free breathing between the attacks are sufficient to distinguish it from either acute laryngitis or laryngeal diphtheria. In the latter affection there is a history of more gradual onset, with cough, hoarseness, fever, malaise, prostration, and it is rare not to find evidence of the membrane in the pharynx. In acute laryngitis the symptoms resemble those of the same affection in the adult, and if there should be any attacks of stridor they are led up to by the progress of the disease, and do not occur with the alarming suddenness of laryngismus stridulus.

* *Brit. Med. Journ.*, July, 1907, and May 8, 1909.

Prognosis.—"An infant, in a severe case, may be suffocated, but more often he sinks, worn out by the frequency and severity of the attacks, or succumbs to pulmonary collapse" (Eustace Smith).

Treatment.—The treatment may be divided into two categories, (1) as to what should be done during the attack, and (2) as to the preventive treatment during the interval.

1. During the attack the child should be freed from any superfluous clothing, supported in the position he most willingly adopts, and the windows should be thrown open (if the bedroom is stuffy, as often is the case). It has generally been recommended to place the child in a warm bath, and administer bromide, chloral, or inhalations of a few drops of chloroform; but, as a rule, relief of the spasm will be more quickly and easily secured by simple stimulating treatment. Cold affusion should be applied to the face and chest, the nasal mucous membrane stimulated with smelling salts, the lips rubbed with a dry towel, and the child slapped on the back. The administration of an emetic of ipecacuanha wine is seldom required. Rhythmical traction on the tongue will often stimulate dilatation of the glottis. Artificial respiration may be required, and, if asphyxiation should threaten, tracheotomy must be performed, if the instruments for intubation are not at hand. Only in very rare instances is tracheotomy called for.

2. During the intervals the general debility must be treated, and all sources of irritation removed. The diet very often is unsuitable, and disorders of digestion are frequently present. The child too often is overladen with clothes; not allowed the free use of his skin and limbs; coddled up in stuffy rooms; and rendered as feeble, sensitive, and unresisting as mistaken care can effect. Bromides and other depressing medicines are given only too readily. In opposition to this, the child should be sufficiently but lightly clothed, kept in well-ventilated rooms, and made to pass as much time as possible in the free exercise of his body in the open air.

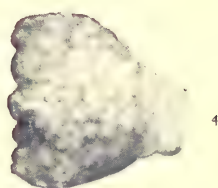
Eustace Smith warmly recommends, as an antispasmodic, 10 to 30 drops of liquid extract of grindelia, in water flavoured with the liquid extract of liquorice and well sweetened with glycerin, every four hours. Chloral may be required. Cod-liver oil, phosphorus, and suitable iron tonics are often indicated.

In infants, in mild cases, a few drops of resorcin (gr. ii-v) in an ounce of normal saline solution or in olive oil (Formula 72) can be dropped into the nostrils several times a day. There is no proportion between the amount of adenoids present and the prominence of the symptoms they give rise to, so that any increase of Luschka's tonsil should be completely removed in these cases.

- Fig. 1.—Epithelioma of larynx, appearing in the form of a snow-white, sharply-pointed "meadow," starting apparently from the left vocal cord, and extending to the ventricular band, arytenoid cartilage, and ary-epiglottic fold of the same side. (*See* p. 526.)
- Fig. 2.—Simple granuloma originating in the scar left after removal of an epithelioma of the right vocal cord. (*See* p. 531.)
- Fig. 3.—Epithelioma apparently involving the whole left vocal cord.
- Fig. 4.—The tumour removed from the larynx shown in Fig. 3 was found, at the operation, to originate by a broad pedicle from the ventricle of Morgagni. The left cord, concealed by the growth, was quite healthy.
- Fig. 5.—Papilloma on an inflamed vocal cord. This occurred in a patient over 60, and aroused suspicion of a possibility of malignancy. But the cord remained mobile, and the growth had not increased markedly when it was removed—three years after first coming under observation.
- Fig. 6.—Tumour of left ary-epiglottic fold, presenting the clinical features of angioma, but, on removal, it was found that this appearance was brought about by an extravasation of blood, and that the growth was an epithelioma. (*See* p. 525.)

(Figures kindly lent by Sir Felix Semon.)

PLATE XVII.



CHAPTER XXXVII

TUMOURS OF THE LARYNX

BENIGN TUMOURS

Definition.—These are innocent or homologous growths, of which the tissue and structure correspond to the tissue from which they originate, or to part of it. Innocent neoplasms are occasionally referred to as laryngeal “polypi,” more particularly in French and German literature.

Frequency.—These growths are comparatively rare. Mackenzie took eight years to collect his first hundred cases,* and individual experience is still more slowly accumulated nowadays. Papillomata and fibromata are most frequently met with. Lipoma, angioma, chondroma, adenoma, myxoma, lymphoma, and thyroid-gland tumours are very rare. Eighteen cases of amyloid tumours have been recorded.†

Varieties. Papilloma.—This is the most common of all benign growths in the larynx. It occurs earlier than any other, and nearly all cases of laryngeal growths met with in infancy and up to the age of 10 are of this character. It may even be congenital.

Situation.—Any part may be attacked, but the tumour chiefly occurs on the vocal cords, the ventricular bands, and the parts below the cords, rarely on the epiglottis, and hardly ever in the interarytenoid region.

Histology.—The structure is that of an ordinary papilloma.

Appearance.—The growth may be single or multiple. It may be broad-based, flat and firm, varying in size from a millet-seed to a walnut, but averaging the dimensions of a large split pea (Fig. 236). In other instances the growth may be more or less pedunculated and heaped up into soft, cauliflower-like masses. The colour is white, pinkish, or even bright-red. The surface is irregularly warty, or mammillated like a raspberry or cauliflower (Fig. 241, p. 521). It is not ulcerated, and does not invade the tissue from which it springs. (Plate xvii., Fig. 5, facing p. 510.)

* “Growths in the Larynx.” London, 1871.

† Saltykow and Johanni, *Ann. des Mal. de l’Oreille*, xxxii., 1904, No. 12, p. 657.

Fibroma ranks second in frequency of innocent laryngeal growths. It occurs at any age from youth upwards. It is said to be most common from 30 to 50, but it may occur later.

Situation.—Fibromata (Fig. 237) are most common on the upper surface of the middle or anterior portion of the vocal cord. They

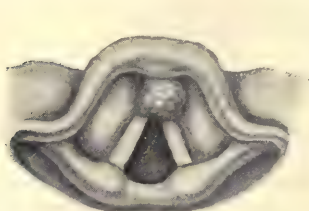


Fig. 236.—Papilloma of the larynx in an adult.



Fig. 237.—Fibroma of the vocal cord.

rarely occur on the ventricular bands or epiglottis; but I have seen them (causing no symptoms) on the posterior surface of the aryepiglottic folds, and they have occurred in the interarytenoid space.

Histology.—They consist of connective, chiefly fibrous, tissue, and a few elastic fibres, covered with epithelium. Œdematous degeneration may take place and go on to softening, so that a

cyst is formed. Hæmorrhage may take place into the growth, and cavernous blood-spaces are thus formed.

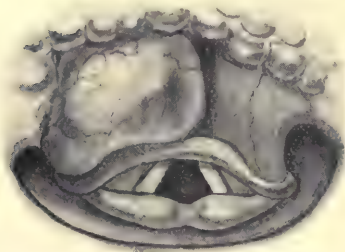


Fig. 238.—Cyst of the epiglottis.

Appearance.—Fibromata are generally single and sessile, or even embedded in the substance of the cord. They may also be pedunculated. The surface is greyish, white, pink or dark-red. The growth is rounded and generally smooth, but it may have a mulberry surface, when it is termed a papillary fibroma. In

size, the growth may vary from a split hemp-seed to an acorn, or it may even be large enough to fill the larynx.

Cystomata.—Pathologically, cysts are due to retention from obstruction in the duct of a muciparous gland, or distension of a lymphatic vessel.

Their most common *situation* is on the anterior surface of the epiglottis (Fig. 238). They are also met with on the ventricular

bands, the ary-epiglottic folds, and the external (pharyngeal) surface of the larynx. They rarely occur on the vocal cords; and when a growth in this situation collapses, with escape of liquid when grasped or incised, it is generally a fibroma which has undergone œdematous degeneration.

In *appearance* they may be broad-based or pedunculated. The surface is smooth, globular, semi-translucent, and blood-vessels are frequently seen coursing over it. The colour is greyish, yellow, pink or red.

Simple incision is not generally effective. Part of the cyst-wall should be torn away with forceps, or a hole should be burnt into it with the galvano-cautery.

Lipoma.—This type of neoplasm is very rare, only ten cases being recorded up to 1896. Pathologically it has been attributed to fatty degeneration taking place in fibromata.

The *situations* where it has been found are the epiglottis, ary-epiglottic folds, the ventricles of Morgagni, and the posterior wall. It may also be attached in the sinus pyriformis, and hang down into the œsophagus.

In *appearance* it is generally large and solitary. It may have a broad base or be pedunculated, and is generally movable. It is smooth, lobulated, yellow, or pale-pink, and elastic.

The tumour can in most cases be brought into direct view with the tongue-depressor, and removed with an ordinary or an electric snare. Lipomata show some tendency to recur.*

Angioma is also very rare.† It is generally single and sessile, very irregular, varying in size from a lentil-seed upwards. It is also met with as a diffuse telangiectasis.‡ It occurs on the vocal cords, ventricular bands, ary-epiglottic folds, or sinus pyriformis (Plate xvi., Fig. 5, facing p. 500). The colour is bright or dark red, and varies much with coughing or speaking. Seeing how successfully nævi are treated with radium, it is worthy of trial in cases of angioma which appear superficial.§ These tumours are apt to be deeper and more diffuse than appearances would warrant, so that they are best left alone unless they give rise to serious symptoms. If bleeding occurs, it can be checked

* P. McBride, *Proc. Laryngol. Soc., London*, iv., Dec., 1896, p. 17.

S. G. Shattock, *Proc. Roy. Soc. of Med., Path. Section*, March, 1909, p. 285. (Gives full description, with picture, of a case, and notes of eight others which have been published.)

M. A. Goldstein, *Laryngoscope*, Sept., 1909. (A well-illustrated article, giving details of one case and full reports of twelve others recorded in literature.)

† O. Hirsch, *Wien. klin. Woch.*, xxi., 1908, No. 16, S. 592.

‡ Norris Wolfenden, *Journ. of Laryngol.*, 1888.

W. J. Bond, *Proc. Laryngol. Soc., London*, vi., Nov., 1898, p. 79.

§ G. Sterling Ryerson, *Journ. of Laryngol.*, xxvii., 1912, No. 12, p. 622.

with the electric cautery. If there is threatening hæmorrhage, electrolysis may be employed, or thyrotomy can be performed and the growth removed.*

Adenomata only occur in the form of cysts due to obstructed and dilated glands. Their favourite site is the epiglottis.

Myxoma is such a rare form of laryngeal tumour that Morell Mackenzie only recalls one instance.† In several cases at first thought to be of this character, a closer investigation proved the growths to be fibromata undergoing myxomatous degeneration.‡ The tumour may be small, not much larger than a pin's head, or it may reach the size of a pea. It may be sessile or pedunculated, has a jelly or cyst-like appearance, and as a rule is implanted on the edge or surface of the vocal cord.



Fig. 239.—Prolapse of the ventricle of Morgagni.

Lymphoma and **enchondroma** are very rare. The latter is really an enchondroma of the laryngeal cartilages, and generally grows from the cricoid. It is usually solitary, hard, sessile, and irregular.§ Multiple **osteomata** also occur.||

Chondromata often require tracheotomy, followed by thyrotomy,

when the growth can be clearly separated from the cartilage to which it is attached.¶

Thyroid-gland tumours arise from abnormal distribution of thyroid tissue. They are of slow growth and covered with normal mucous membrane.**

The so-called **prolapse of the ventricle of Morgagni** is conveniently referred to in this section, as it clinically resembles a

* E. Hamilton White, *Wien. klin. Woch.*, xxi., 1908, No. 16, S. 571.

† "Diseases of the Throat and Nose," i., p. 306.

‡ J. W. Bond, *Proc. Laryngol. Soc., London*, iii., 1895, pp. 66 and 81.

§ StClair Thomson, *ibid.*, iii., 1895, pp. 67 and 82.

¶ M. Durand and J. Garel, *Ann. des Mal. de l'Oreille*, xxxiv., ii., 1908, No. 12, p. 629.

A. Durand, "Les Chondromes du Cartilage Cricoïde," Thèse de Lyon, Juin, 1910, p. 74; and *Ann. des Mal. de l'Oreille*, xxxix., 1913, No. 5, p. 506.

|| Harold S. Muckleston, *Laryngoscope*, xix., 1909, p. 881.

¶ J. W. Bond, *Lancet*, June 3, 1893, p. 1309.

** Walter A. Wells, *Journ. of Laryngol.*, Oct., 1902.

benign neoplasm, although its pathology is uncertain. A smooth, pink, fleshy growth, with a broad base, is seen issuing from the ventricle of Morgagni, and resting on the vocal cord (Fig. 239). With a probe it can be more or less completely tucked into the sacculus laryngis, and hence it has been regarded as a prolapse of the ventricle. It is extremely doubtful if such an event can happen. The appearance is more likely to be due to hypertrophy of a portion of the mucous membrane of the ventricle. Koschier made a histological examination of nineteen cases, and demonstrated that there was no actual eversion of the sinus in any instance. The appearances were due to solid tumours, cystic or fibromatous, taking their origin from the wall of the sinus, which remained *in situ*.* (Plate xv., Fig. 1, facing p. 468.)

Mycosis fungoides is a disease which rarely attacks the pharynx and larynx. In one case small oval tumours, with superficial ulcerated surfaces, were found scattered over the pharynx and arytenoid region. The tumours of the disease were scattered over the trunk and limbs.†

Etiology.—The cause of benign growths in the larynx is uncertain, and little is known on the subject, except that undoubtedly sex and age are two important etiological factors. At all ages the number of males affected preponderates in the proportion of 3 to 1. Omitting the first year of life, there is a steady increase in the number of cases up to the age of 40, followed by a decline. By some observers the ages between 30 and 40 are said to be the most susceptible, but Morell Mackenzie gives the years between 40 and 50. Anyhow, benign growths are met with most frequently between 20 and 50. Papillomata and cysts are occasionally congenital. Chronic laryngeal catarrh, over-use of the voice, chronic nasal and pharyngeal affections appear to have no influence in the production of these growths.

Situation.—The vocal cords themselves are specially liable to be affected, while the arytenoid region, so vulnerable in tuberculosis, enjoys great immunity.

Symptoms.—These vary much in different cases, and depend on the size, situation, and attachment of the growth. Some patients are quite unconscious of the presence of a laryngeal neoplasm, which may be discovered by accident. This was what occurred in the case of the cyst of the epiglottis represented in Fig. 238. I know of two professional vocalists with fibroma on the posterior surface of the ary-epiglottic folds, of which they are quite unaware,

* *Wien. klin. Woch.*, 1897, No. 37.

Roger Lussan, Thèse de Bordeaux, 1898.

† F. de Havilland Hall, *Proc. Laryngol. Soc., London*, ii., 1895. p. 70.

as it never interferes with their voices. In one case I have known of its existence for fourteen years, but have carefully refrained from informing the owner of its presence, as she would doubtless become unduly anxious about it, and might insist on its quite unnecessary removal. Discomfort in the larynx, effort in speaking, followed by fatigue and hoarseness, are chiefly complained of when the neoplasm is situated on a cord or on the margin of the rima glottidis. Dysphonia may occur erratically, as the growth may only at times interfere with the action of the cords. The voice may be muffled or gruff, or the patient may speak in a high and monotonous key. There may be temporary or permanent aphonia, or whispering; and I have known of a small child with papilloma brought on account of "dumbness," although a year previously she had talked fluently. Sometimes a growth does not impair the speaking voice but entirely destroys several notes in singing. A small sessile growth may interfere with vocalization more than a large pedunculated one, particularly if it is situated on the free margin of the cord and near the anterior commissure.

Dyspnœa is met with in multiple papillomata, and in large growths like lipomata. Attacks of suffocation occur more frequently towards evening or during the night. Inspiration is, as a rule, much more difficult than expiration, and thus the character of the respiration has a certain diagnostic value as regards the seat of the growth. When inspiration is noisy and stridulous, and expiration comparatively easy, the growth is probably above the vocal cords, and vice versa.* Stridor is more marked on exertion and during sleep. It is generally an indication for operation. Papilloma may cause complete obstruction of the larynx, chiefly in children; and an adult may neglect the symptoms caused by some innocent tumour, until it suddenly occludes the glottis more or less completely.

Cough is rare, but is sometimes croupy or paroxysmal. Dysphagia is still more rare. An attack of laryngitis is more severe and prolonged than in a healthy larynx. There is no pain or general disturbance of health.

Diagnosis.—In addition to the guidance afforded by a consideration of the age and sex of the patient, and the history of the growth, the diagnosis will be largely based on inspection. Examination may, in some instances, be supplemented with the probe. Some difficulty may be encountered in distinguishing a simple neoplasm from a tuberculoma (p. 643), when the latter does not present an ulcerated surface, or is unaccompanied by evidence of pulmonary tuberculosis. In a few cases diagnosis has

* M. Mackenzie, "Growths in the Larynx," i., p. 23. London, 1871.

to await removal of the growth and its microscopical examination. In certain instances, fortunately rare, it is not easy to distinguish a simple from an early malignant growth, but the following table indicates the chief points of difference:—

DIAGNOSIS OF BENIGN AND MALIGNANT NEOPLASMS
OF THE LARYNX

<i>Benign</i>	<i>Malignant</i>
Rare after 50.	Rare under 40; and generally occur over 50.
Occur on the anterior two-thirds of the vocal cords in the majority of cases.	A solitary growth on the ary-epiglottic folds, the epiglottis, or near the vocal processes, is very suspicious in patients over 45.
Grows away from the tissues.	Invades the tissues.
Base of growth, or cord it springs from, only inflamed during laryngitis.	Inflamed base.
May impair action of cord mechanically.	Any impairment due to infiltration is strongly suspicious.
No ulceration.	Tendency to ulceration.

Progress and prognosis.—After reaching a certain degree of intensity, symptoms may remain stationary for years. I have seen many innocent growths unaltered after ten or fifteen years, and some patients give a history which indicates that a laryngeal neoplasm has existed for thirty or more years.

Papillomata in adults do not tend to rapid growth, but in children they may be regarded as locally malignant, so rapidly may they recur. They may even grow down the trachea, and, if tracheotomy is performed, spread to the edges of the wound. But, on the other hand, they may slough off and be coughed up; they tend to spontaneous atrophy and they may disappear after acute infectious diseases, and often after tracheotomy.

Asphyxia in children is a possibility which should not be forgotten. In adults, complete removal of an innocent neoplasm is not followed by recurrence, and the prognosis in relation to voice is good, although it may have to be somewhat guarded in very minute growths owing to the difficulty of complete removal. In children, prognosis in regard to voice is good if intralaryngeal removal can be employed.

Malignant degeneration of an innocent neoplasm may occur, but a collective investigation by Semon has demonstrated that it is of the greatest rarity, and one which is in no way influenced by intralaryngeal treatment.*

* *Centralbl. f. Laryngol.*, vi., Dec., 1889, pp. 284-289.

Treatment.—Some innocent growths, as already indicated, may, under certain conditions, be left alone. Among these are cysts of the epiglottis, small growths on the ventricular bands or posterior surface of the ary-epiglottic folds, and small fibromata on the vocal cords of those who are not professional voice-users.

Spontaneous separation has been recorded in a few rare instances.* Delavan has reported a case in which a large papilloma completely disappeared under prolonged use of a spray of absolute alcohol. But the majority of cases will call for removal. External operation, except in very large extrinsic growths, is nowadays unheard of in the treatment of simple laryngeal neoplasms in adults, and should only be resorted to when an expert has failed *per vias naturales*. The smaller the growth, *ceteris paribus*, the greater the difficulty

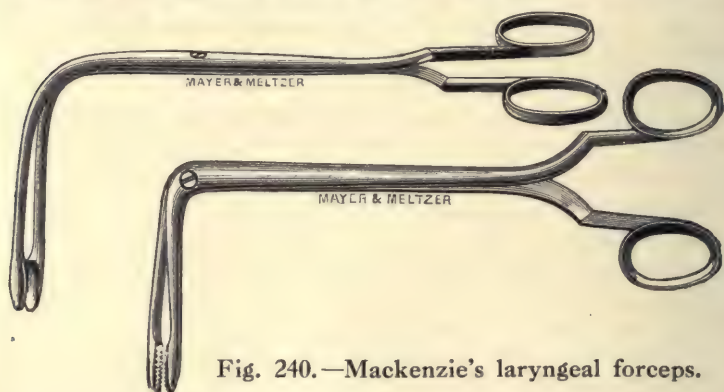


Fig. 240.—Mackenzie's laryngeal forceps.

in removing it. The posterior part of the larynx is more accessible than the anterior; and the difficulty of removal is very much increased when the growth is below the glottis.

As regards instruments, a snare is seldom employed, for although it seems indicated for pedunculated growths, yet its use is not free from risk. The wire may become embedded in a tough growth which it may fail to cut through, and from which it cannot be detached. Chemical caustics—chromic acid, nitrate of silver, sulphate of copper—may be required for application to the diseased base of a growth, but removal is best effected by such laryngeal forceps as those of Mackenzie, Schrötter, Jurasz, Killian, Dundas Grant, or Watson Williams.† In common with most laryngologists who have become accustomed to its use, I prefer Mackenzie's spoon-bladed forceps, the edges of which should be in complete approximation so that they bite well (Fig. 240). This instrument

* Morell Mackenzie, *op. cit.*, p. 33.

† Dundas Grant, *Journ. of Laryngol.*, xix., 1904, No. 12, p. 637.

looks heavy and clumsy in comparison with some of the others mentioned, but many growths are very tough, and very firmly attached, so that it requires some force to remove them. The Mackenzie forceps also enable the operator to make use of his tactile sensations both in seizing and removing the growth. Several sizes should be at hand, as the larynx is often deeper than would be imagined beforehand. For growths situated on the epiglottis, cords, ventricular bands, or ary-epiglottic folds, antero-posterior forceps will be found most useful. Those situated in the posterior or anterior commissures may require forceps which act in a lateral plane. For growths situated below the cords, the forceps are made with the extremity tilted forwards or backwards. In some instances punch-forceps will be found more useful. It is impossible to refer to all the several indications for the use of different intralaryngeal instruments, and a reference to any instrument catalogue will show how various they have to be.

The pharynx is first sprayed with a 2-5 per cent. solution of cocaine, as abeyance of the pharyngeal reflex is as important as anæsthesia of the larynx. The larynx is then completely anæsthetized with cocaine, and a freshly made 20 per cent. solution will often prove satisfactory in this region when weaker solutions, or those which have been prepared some time, have proved inadequate. It can be used in a spray, but it is better to trickle the solution over the larynx from a syringe (cf. p. 76). The instruments are sterilized and warmed by passing them through the flame of a spirit lamp. The confident co-operation of the patient is necessary, as he has to be entrusted with holding out his tongue, and he will be required to breathe, cough, or phonate promptly as directed by the operator. It is better not to have his head supported. A fairly large laryngeal mirror should be used and held in the left hand of the operator, who grasps it close to the patient's mouth whilst he rests the ring and little finger against the cheek. The warmed forceps are introduced closed, and then opened just over the growth, which they should be seen to grasp firmly before removal. A twisting as well as a pulling action is often required. In some cases a growth can only be satisfactorily seized at the moment of phonation, when it is thrown up between the cords (Fig. 232, p. 497). Neoplasms on the right side of the larynx are easier to remove than those on the left. Unless the operator is ambidextrous, a growth on the left cord can be seized by sloping the angle of the forceps across to the opposite side of the pharynx. In certain cases, and in subjects who cannot be manipulated without a general anæsthetic, removal can be effected by direct laryngoscopy (*see* p. 46).

As no practitioner should venture on these delicate operations who is not already thoroughly skilled in intralaryngeal manipulation, it is unnecessary to enter into further detail.

As regards **after-treatment**, rest to the voice should be enjoined, a sedative lozenge of menthol or morphia may be given, and if there has been any traumatism a steam inhalation may be prescribed (Formulæ 45, 42, and 13, pp. 808 and 803).

Papillomata in children require separate consideration, because (a) they are more apt to cause respiratory obstruction, (b) they sometimes disappear spontaneously, and (c) they are liable to recur after removal.* If there is no decided laryngeal stenosis, particularly at night, it is well to defer the operation in infants and young children until an age when they can be trained to show the larynx. During this period the prolonged administration of arsenic may be tried; iodide of potassium has been recommended, and success has been claimed from the internal administration of calcined magnesia in doses of 75 gr. (5.00) daily.† The results of radium treatment have also been praised, but the difficulties in the way of making the applications through the mouth render the method difficult and almost impossible in children.‡ Adenoids, which are said to be frequently associated, should be attended to. If suffocative symptoms should threaten before this age is attained—and children as young as 4 can frequently be educated to tolerate the laryngeal mirror—intralaryngeal removal should be attempted. But in all cases it is preferable nowadays to administer chloroform and remove the growths by Killian's direct laryngoscopy (p. 46), or under suspension laryngoscopy (p. 49).

If these methods are not available, and the symptoms call for interference, tracheotomy should be performed (p. 775). This is done as low as possible to diminish the risk of the wound being invaded by the papillomata, and to avoid the chance of subsequent stenosis. Once the danger of obstruction has been removed by the tracheotomy, direct intralaryngeal removal should be repeated under chloroform, or chloroform and cocaine. But the tracheotomy tube may have to be worn for two or more years, when the papillomata generally tend to disappear.§

Thyrotomy, or laryngo-fissure, would at first sight appear

* Harmon Smith, *Laryngoscope*, xix., 1909, No. 2, p. 81.

† R. Clauoué, *Ann. des Mal. de l'Oreille*, xxxvi., 1911, No. 1, p. 11.

‡ Polyák, *IIIrd Internat. Cong. of Laryngo-Rhinology*, Budapest.

§ Thomas J. Harris, *Proc. XVIIth Internat. Cong. Med.*, London, 1913, Section xv., Part ii., p. 93.

§ StClair Thomson, "Papilloma Cured by Three Years' Treatment with Tracheotomy and Repeated Operations by Direct Laryngoscopy," *Proc. Roy. Soc. Med.*, Laryngol. Section, vol. iii., Nov., 1909 p. 11.

T. Hubbard, "Papilloma of the Larynx," *Trans. Amer. Laryngol. Assoc.*, 1915.

Fig. 1.—Malignant disease of the larynx; first appearance as an irregular thickening of the left cord. This remained stationary for nearly two years, when it rapidly changed into the condition shown in the next figure.

Fig. 2.—Malignant disease of the larynx; later stage of the case shown in Fig. 1.* (See p. 525.)

* F. Senon, *Proc. Laryngol. Soc., Lond.*, 1893 (*Lancet*, 1894).

Fig. 3.—Laryngeal tuberculosis, simulating malignant disease. The diagnosis of malignant disease was supported by the age of the patient, viz. 70, and by the impaired mobility of the cord. (See p. 526.)

Fig. 4.—Extravasation of blood into and below the right vocal cord, simulating malignant disease of the larynx. (See p. 493.)

(The above four figures are kindly lent by Sir Felix Senon.)

Figs. 5 and 6.—Epithelioma of the larynx, involving all the right cord, the anterior commissure, and part of the left cord. Fig. 6 shows the appearance during phonation, and indicates the immobility of the right cord. Laryngo-fissure was performed, and it was then found that the granulation in the anterior commissure was due to invasion of the perichondrium, and that the disease had become extralaryngeal and was too advanced to be removed by this operation. (See p. 530.)

Fig. 7.—Epithelioma of the larynx. The disease was removed by laryngo-fissure, performed under cocaine, eight years ago. The patient has no trace of recurrence, and has a useful rough voice. (See p. 530.) (Cf. *Brit. Med. Journ.*, 1912, i., Feb. 17.)



1



2



3



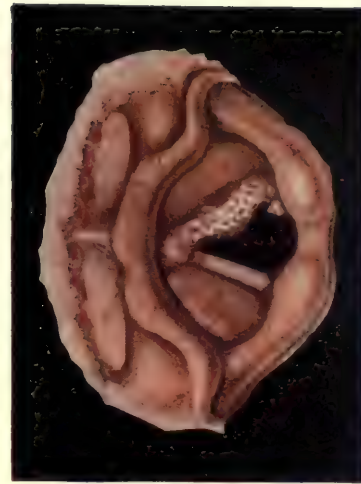
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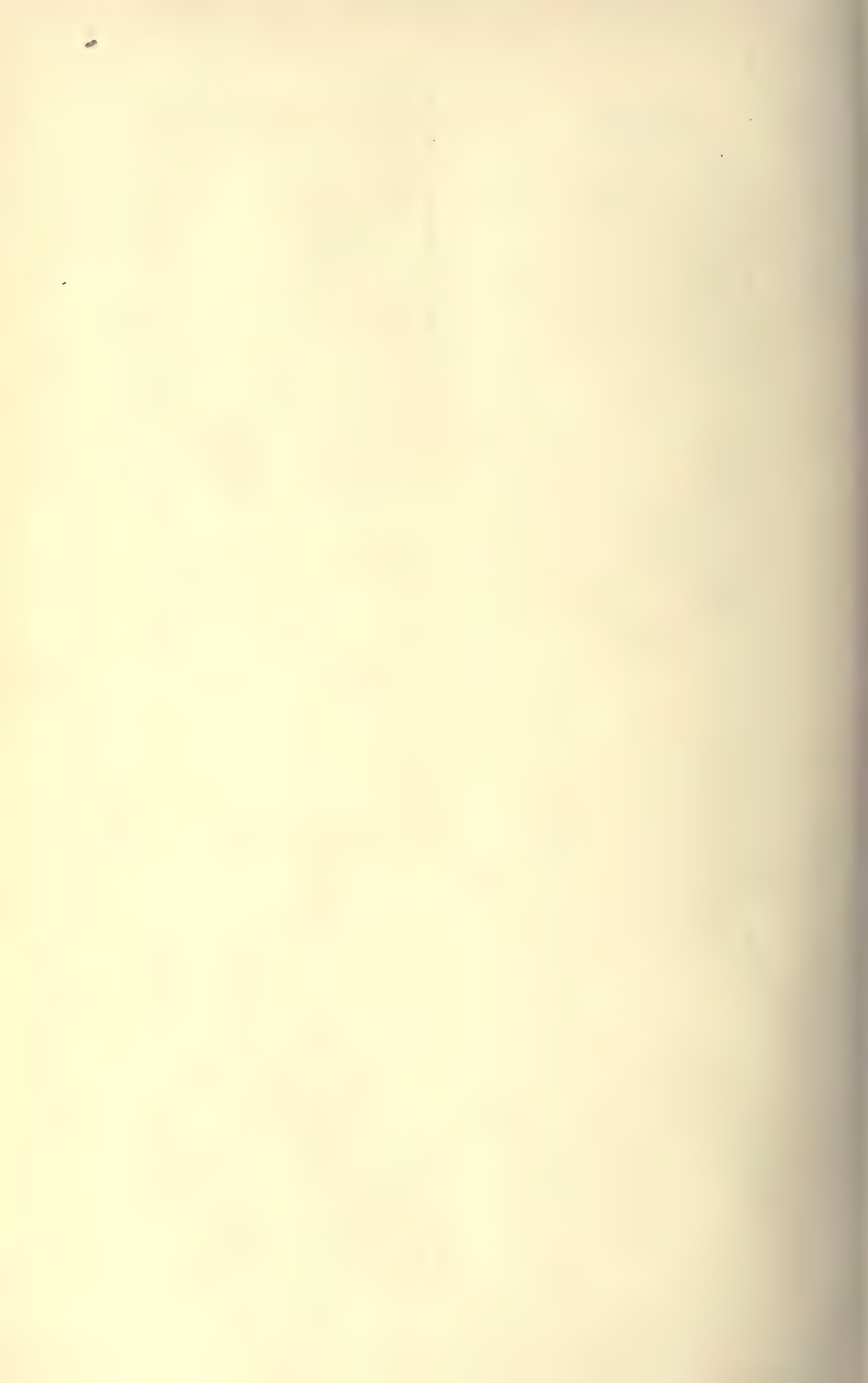


6



7

PLATE XVIII.



suitable for cases where the growths persist, and intralaryngeal extirpation has failed. But the operation has been discredited owing to the risk of permanent impairment to the voice, and the frequent recurrence of the papillomata after, apparently, the most thorough removal. Semon mentions a case in which no fewer than 17 thyrotomies had been performed on the same patient, with recurrence of the growth on each occasion.* Betham Robinson has recorded a case in which endolaryngeal operations, mostly under chloroform, had been performed 19 times, tracheotomy 3 times, intubation 3 times, and thyrotomy and laryngotomy had also been performed. Death took place suddenly, and the post-mortem showed the papillomata not only around the upper laryngeal orifice and in profusion within the larynx, but spreading over the pharyngeal surface of the cricoid cartilage to the œsophagus. There were also scattered patches on the tonsils and posterior surface of the tongue† (Fig. 241). With a personal experience of 800 cases of laryngeal growths, many of them papillomata, Massei condemns laryngo-fissure as unnecessary, and caustics as useless and harmful.‡ He recommends intralaryngeal operation, with or without tracheotomy, although treatment may have to be prolonged for months or years.

A few cases of large, extrinsic, simple laryngeal growths may require removal by an external operation.



Fig. 241.—Papillomata of larynx.
Case of H. Betham Robinson.†
(*St. Thomas's Hosp. Mus.*, No. 1791 B.)

MALIGNANT TUMOURS

These growths, though by no means rarely met with after the age of 40, are, fortunately, less frequent than benign growths in the larynx, or than cancer in many other regions. Carcinoma

* *Proc. Laryngol. Soc., London*, Jan. 1, 1894, p. 62.

† *Ibid.*, xiv., March, 1907, p. 64.

‡ *Boll. delle Mal. dell' Orecchio*, xxv., fasc. 10.

and sarcoma will be considered together, as they are indistinguishable clinically.

Etiology.—Of the origin of cancer nothing positive is known. Such predisposing causes as heredity, long-continued irritation, excessive voice-use, abuse of alcohol or tobacco, and syphilis have been blamed for its laryngeal manifestation, without sufficient justification. Men are more liable to it, as to most laryngeal affections, than women. Age has a marked influence, the disease being rarely met with below the age of 40, and most commonly between 50 and 60. As it is not infrequently found between 40 and 50, some difficulty is occasionally encountered in distinguishing it from simple neoplasms, which are not uncommon in that decade. It may occur in old age. Malignant growths may exceptionally arise in early life, and are then found more frequently in females and on the pharyngeal surface of the larynx. Thus, McBride records a case in this region in a girl of 24.* I have published a case in a young man aged 23.† Garel had an intrinsic case in a girl of 18,‡ and Chiari has published a case of epithelioma on the vocal cord of a girl of 16.§

There is no proof that benign growths have any special liability to undergo malignant degeneration, or that this transformation occurs particularly after intralaryngeal operations.||

Pathology.—Epithelioma is far more common than any other variety of malignant disease. Sarcoma of the larynx is very rare, and more often commences in the subglottic region, and medullary cancer is still more infrequent. Glandular carcinoma is most common in the epiglottis.

Cancer of the larynx is either primary or due to direct invasion from neighbouring structures. It scarcely ever arises from secondary infection. Newman ¶ and Semon** have observed cases of "infection by contact" where a long-standing epithelioma of one cord has been followed by a similar symmetrical growth on the opposite, and previously sound, cord. Cancer spreads by continuity from its periphery, and so it may overstep the limits of the larynx and, according to its situation, involve the pharynx, œsophagus, tongue, or trachea. In rare cases of laryngeal cancer a dense pedicle (chiefly of connective tissue) forms, on which the carcinoma rests.

* *Med. Chronicle*, Feb., 1896.

† *Proc. Royal Soc. Med.*, Laryngol. Section, April and Nov., 1911.

‡ *Ann. des Mal. de l'Oreille*, xxix., ii., 1903, No. 11, p. 377.

§ H. Marschik, *Monats. f. Ohrenheilk.*, 1909, No. 9, 43 Jahr.

|| F. Semon, *Internat. Centralbl. f. Laryngol.*, vi., Dec., 1889, pp. 271-289.

¶ *Trans. Clinical Soc., London*, xxii., p. 101.

Glasgow Med. Journ., xxix., Feb., 1888, p. 96.

** *Brit. Med. Journ.*, April 7, 1888, p. 746.

Metastases are very rare,* though a few cases have been recorded in which secondary affections in the liver, stomach, kidney, or lung were found, without recurrence in the larynx which had previously been operated on.†

This freedom of the larynx is ascribed to the peculiar arrangement of the lymphatics within the larynx. Although very richly developed, they do not anastomose with neighbouring lymphatics, but form a network of their own which empties into two small glands on each side.‡

Clinical classification.—It was proposed by Krishaber§ to classify laryngeal cancers into—

(a) *Intrinsic*, i.e. arising from the vocal cords, the ventricles and ventricular bands, the interarytenoid region, and the subglottic area.

(b) *Extrinsic*, i.e. those growing from the epiglottis, arytenoids, ary-epiglottic folds, the pyriform sinuses, and the pharyngeal surface of the cricoid cartilage.

(c) *Mixed*, i.e. a combination of extrinsic and intrinsic, in which class must be placed a large number of cases which only present themselves in an advanced stage.

This classification has been generally adopted on account of its clinical usefulness. For extrinsic cancer is “a dire disease.” In it the glands are affected at an early period; the course of the disease is rapid, and it is seldom checked or cured by operation. Intrinsic cancer, on the other hand, is a much less hopeless form. It spreads slowly, does not infiltrate so rapidly, and in early stages is curable. So long as the disease is limited to the interior of the larynx it does not affect the lymphatic glands, and secondary growths are almost unknown. It is a fortunate fact that, according to some statistics, the intrinsic variety would appear to be the more frequent.¶

A cancer may originate in any part of the larynx, but the cords are the regions most frequently affected. Schmiegelow, in 66 cases of intralaryngeal cancer, found that it originated from the cords in at least 36 cases. In 18 instances the growth had extended too far to determine the primary origin, but doubtless

* A. Bronner, *Proc. Laryngol. Soc., London*, ii., Oct., 1894, p. 4.

† Henry B. Sands, *N.Y. Med. Journ.*, i., 1865, p. 110.

Virchow, *Deut. med. Woch.*, xx., Juni 28, 1894, S. 52, v.

‡ M. B. Cunéo, *Gaz. des Hôp.*, 75^e Année, 13 Déc., 1902, No. 141.

D. Crosby Greene, *Trans. Amer. Laryngol. Assoc.*, 28th Congress, 1906, p. 63.

§ *Gaz. Hebdom.*, xvi., 1879, p. 518.

¶ Butlin, *Brit. Med. Journ.*, Aug. 23, 1890.

¶ Semon, *Lancet*, Dec. 15-29, 1904.

Semon, *Brit. Med. Journ.*, Feb. 2, 1907, p. 241.

Chevalier Jackson, *Laryngoscope*, xix., Aug. 1909, No. 8, p. 587. (Of 141 cases the disease was intrinsic in 98 and extrinsic in 43.)

in several of them it may have been the cords.* This is fortunate, for a carcinoma tends to grow parallel to the long axis of the cord, and involve it for a large extent, before encroaching on surrounding parts.†

Symptoms.—The early symptoms of a laryngeal cancer are vague and variable, depending to a large extent on the size and situation of the neoplasm. A small growth on a cord will produce a marked degree of hoarseness, while in such a situation as the ary-epiglottic fold it may reach a considerable size, and even produce a large secondary swelling in the neck, without causing sufficiently decided symptoms to attract attention. The urgently important point is that neither patient nor practitioner should wait for the appearance of the symptoms which were given in the older textbooks as indicative of laryngeal cancer, viz. dyspnoea, dysphagia, hæmorrhage, salivation, pain in the ear, fetor, glandular infiltration, or cachexia. These only indicate a late, and generally hopeless, stage of the disease. Any continuous discomfort in the throat, or any hoarseness lasting more than a few weeks in a patient over 40 years of age, should call for a thorough examination of the larynx by a skilled laryngologist.

Obstinate hoarseness is the most general symptom, particularly in intrinsic cases. It may be out of proportion to the size of the tumour, when the latter infiltrates a vocal cord. It will also be marked if the movement of the arytenoid cartilage is interfered with, the recurrent laryngeal nerve involved, or the postici muscles infiltrated. When one cord is fixed there may be the voice of "phonative waste." Cough is not a usual symptom.

Pain is seldom complained of until the disease is well advanced. Then, and particularly in the extrinsic form, it is often severe, radiating up to the ear and the side of the head, and being much increased by swallowing. Respiratory obstruction is more marked in the intrinsic form, while the extrinsic form is more apt to produce pharyngeal symptoms or interference with deglutition.

Loss of appetite, cachexia, and more general symptoms occur earlier in the extrinsic than in the intrinsic form of laryngeal cancer. With the latter there may be a history of one or two years' hoarseness, or even longer, without any other local or general symptom (Plate XVIII., Figs. 1, 2, and 7, facing p. 520). Once the growth begins to ulcerate or the glands become distinctly affected, other symptoms are added. The mouth and pharynx become very septic; the breath has a sickly fetor; hæmorrhages occur; the glands on each side are infiltrated and tender; abscess

* *Lancet*, Aug. 1, 1914, p. 300.

† F. Blumenfeld, *Zeitschr. f. Laryngol.*, Bd. iii., Heft 3.

and necrosis of the laryngeal cartilages may ensue ; the symptoms of œsophageal cancer are superadded ; pain, dysphagia, dyspnœa, and septic absorption cause rapid loss of flesh and strength.

The course of the disease may thus be roughly divided into three stages, which vary considerably in the severity of their symptoms. In the first stage there will be only slight hoarseness if the disease is intrinsic, and merely a discomfort in the pharynx or some embarrassment in swallowing with the extrinsic variety. The general condition is otherwise unaffected. In the second stage the hoarseness increases, dysphagia is more marked, dyspnœa may threaten, and pain may be complained of. Still, the patient's general condition may be excellent. In the third stage there are hoarseness, aphonia, dyspnœa, dysphagia, pain, fetor, enlarged glands, wasting, loss of strength ; and death soon follows from cachexia, hæmorrhages, or septic pneumonia. The larynx is sometimes tender to touch on the affected side, and may be found broadened when the growth is considerable.

Examination.—Epithelioma of the larynx may appear under various manifestations. In an early stage nothing may be visible beyond a persistent congestion with some slight thickening (Plate XVIII., Fig. 1). It can occur as a definite tumour, when it may resemble a benign papilloma, fibroma, or angioma (Plate XVII., Fig. 6) ; or as a more irregular infiltration, when it is sometimes difficult to distinguish it from a tuberculous or syphilitic deposit. On the vocal cord either of these forms may occur. The defined tumour is generally single and sessile, white or reddish-grey, and warty-looking (Plate XVIII., Fig. 7). The infiltration form is diffuse, congested, with a rough, grey, pink or yellowish-pink surface (Plate XVIII., Fig. 2). Sometimes it is more markedly white in colour, and gives an irregular, fringe-like border to the cord (Plate XVII., Figs. 1, 3, and 4). On the ventricular band or the ary-epiglottic fold the earliest appearance may be that of a dusky-red, uniform swelling or definite tumour, which is generally of a fleshy colour and with an uneven or moriform surface (Plate xv., Fig. 7, facing p. 468). A malignant growth on the pharyngeal surface of the larynx may only present the upper margin in the laryngeal mirror. It is best seen during phonation or by hypopharyngoscopy (p. 46), or by direct laryngoscopy with a Mosher spatula (p. 46), and is generally fleshy-looking. On the epiglottis a cancerous growth is irregular, greyish, pinkish-white, dusky red, or dirty white. Here it ulcerates early.

It is as important as it is sometimes difficult to recognize these early appearances. At first the growth, particularly in the intrinsic form, develops slowly, but in all suspicious cases it should be

inspected at regular intervals. Once the neoplasm ulcerates and breaks down, it develops more rapidly, and the irregular, fungating, infiltrating, sloughing, and bleeding growth leaves little doubt as to its nature. Sometimes ulceration, œdema, abscess, perichondritis, or necrosis may be the first symptoms when the patient comes under notice, and they so overshadow the original disease that it may be impossible to say where it started. In extrinsic cancer the cervical glands are generally invaded early, but absence of this symptom must not be taken to invalidate a diagnosis of malignancy, particularly in the intrinsic form.

Diagnosis.*—Laryngeal cancer may be confounded with chronic laryngitis, syphilis, tuberculosis, pachydermia, perichondritis, benign growths, blood-clots (Plate XVIII., Fig. 6, and cf. p. 493), or laryngeal palsy. In advanced cases the characteristics just enumerated establish the diagnosis without much difficulty. In early cases it is often by no means easy. The one-sided character of any inflammation or infiltration would be suggestive of some serious condition such as cancer, tubercle, or syphilis. Marked subjective symptoms, not explained by physical signs, also arouse suspicion.

A conspicuous feature, which helps to distinguish some cases of intrinsic laryngeal cancer from simple neoplasms, is the early interference with the movement of the cord. The importance of this was pointed out by Lublinski,† and has been strongly emphasized by Semon.‡ A tumour on the cord, or near the crico-arytenoid joint, may produce a sluggish action manifestly out of proportion to its apparent size.§ Sometimes the cord becomes absolutely fixed (Plate xv., Fig. 7, facing p. 468, and Plate XVIII., Figs. 5 and 6, facing p. 520), though not by mere mechanical obstruction to its movement. This feature is due to the infiltrating action of malignant neoplasms, and it should always lead us to suspect cancer. Hence, on the other hand, any thickening or injection in a paretic or fixed vocal cord might raise a false suspicion of malignancy.|| But the absence of this fixation of the

* F. Semon and W. Jobson Horne, "The Differential Diagnosis of Tuberculosis," Syphilis, and Malignant Disease of the Larynx," *Journ. of Laryngol.*, xxii., 1907, No. 11, pp. 549 and 561.

F. Semon, "A Contribution towards the Diagnosis of Laryngeal Cancer," XVI. *Congrès Internat. de Méd.*, Budapest, 1909, 1^{re} fasc., p. 1.

† Lublinski, *Berlin. klin. Woch.*, 1886, No. 8.

‡ Heath's "Dictionary of Practical Surgery," i., 1886, p. 895.

Trans. Clinical Soc., London, xx., p. 46.

Brit. Med. Journ., 1888, i., p. 1240.

Centralbl. f. Laryngol., v., pp. 52, 268.

§ Gerhardt, "Die Krankheit Kaiser Friedrich des dritten," pp. 5-6. Berlin, 1888.

F. Fraenkel, "Der Kehlkopfkrebs, s. Diagn. u. Behandl." Leipzig, 1889.

|| P. de Santi, "Case of Parathyroid Tumour causing Symptoms of Malignant Disease of the Larynx: Operation and Recovery," *Proc. Laryngol. Soc.*, London, vi., June, 1889, p. 104.

cord must not be allowed to invalidate an early diagnosis of intrinsic laryngeal cancer; it is a comparatively late symptom indicating a deep extension of the growth or an origin in the subglottic area, and is therefore not of good augury.

In a defined unilateral growth which might at first suggest a benign neoplasm, suspicion should be aroused if it occurs in a patient over 40, especially if there is any infiltration or impairment of action in the cord, if it is situated in the posterior third of the larynx, and if the surface is white or greyish. The cases which, at first sight, resemble a benign papilloma are apt to show more spiked papillæ, suggesting the appearance of a short-cropped, snow-white "meadow" (Semon) (Plate xvii., Fig. 1, facing p. 510). This surface may also be greyish-white or reddish; it may be diffuse, and recurs rapidly after removal. When any apparently benign growth has been removed in a person over 40, and the wound, instead of healing, remains sloughy, or the growth recurs, its malignant character is suggested.

In many cases the diagnosis is only arrived at by watching the progress of the case, by the exclusion of other possibilities, and by the effect of treatment. The progress of malignant disease is generally continuous, although in some cases it may appear to be temporarily arrested, and, occasionally, even apparently improved.

A deep or diffuse swelling in the epiglottis, ventricular bands, arytenoids, or ary-epiglottic folds may resemble a syphilitic or tuberculous lesion, particularly when the latter occurs in elderly adults (Plate xv., Fig. 6, facing p. 468). But, if extensive, neither of these processes is accompanied by such a marked glandular enlargement as in the case of a malignant growth of the same size. In early stages there is more difficulty, but a gumma is more rapid in its evolution, is rarely painful, and generally yields to treatment. On the other hand, it must be remembered that the symptoms of malignant disease may be decidedly mitigated for a time by the administration of iodide of potassium.

Epithelioma may supervene on a syphilitic process in the larynx, or may attack a patient with tuberculosis in the lungs,* or one in whom phthisis has been arrested,† or may develop in a larynx already affected with tuberculous laryngitis,‡ or it may even follow syphilis and tubercle.§ It is not so serious an error to mistake an advanced case of tuberculosis for cancer,

* D. B. Delavan, *N.Y. Med. Journ.*, Nov. 8, 1890.

† StClair Thomson, *Proc. Laryngol. Soc., London*, xii., Jan., 1905, p. 32, and March, 1905, p. 72.

‡ H. B. Robinson, *ibid.*, v., May, 1898, p. 81.

§ Clifford Beale, *ibid.*, iv., Nov., 1896, p. 2.

as to fail to recognize malignant disease in an early or operable stage, or syphilis which is curable without operation.

The appearances of tuberculosis are generally characteristic. In doubtful cases a complete examination of the patient must be made, and, in the event of a negative result, a careful watch maintained for the onset of confirmatory evidence. The exclusion of syphilis may be assisted by the Wassermann serum test. Unless the diagnosis of cancer is manifest, the patient should receive thorough anti-syphilitic treatment, including the administration of mercury by the skin.*

In doubtful cases, if the growth is not a deep diffuse infiltration, a portion may be removed for microscopic examination, provided a good-sized portion embracing the deeper strata can be excised. If only a small superficial portion is obtainable, the microscopic evidence is likely to be unconfirmatory, as the real tumour may be seated some distance below a simple inflammatory or papillomatous surface. In that case the traumatism produced would only obscure the evidence otherwise obtained from the progress of the case. In most instances and particularly where the neoplasm is imbedded in the cord, or tucked away below it in the subglottic area—microscopic examination is impossible, and a diagnosis must be formed without it. Of course, if the removed fragment yields definite evidence of malignancy, the diagnosis is settled, but a negative result will not necessarily remove the doubt.

Not only must a good portion be excised, but we must remember that the pathologist has no specific character to guide him, although the future may reveal one. Meantime, it is well to remember the signs which render the diagnosis of carcinoma probable. They are thus described by B. Fraenkel:—Atypical epithelial prolongations, which dip deeply into the connective tissue as they divide, showing an irregular structure; absence, at base, of cells, rendering the frontier line of the mucous membrane indistinct; collections of cells simulating giant cells and cell nests. If these signs are combined, probability is almost a certainty. The latter is evident when we see atypical epithelial islets no longer in touch with the surface.†

Prognosis.—Untreated malignant disease of the larynx inevitably ends in death by asphyxia, dysphagia, hæmorrhage, sepsis, or intercurrent complication. The duration of such cases is seldom

* For an instructive case, where the diagnosis of malignant disease was made by several experts after the administration of iodide of potassium, where a laryngectomy was initiated, and abandoned as hopeless owing to the involvement of glands, and where the patient made a spontaneous recovery after tracheotomy, see *Proc. Laryngol. Soc., London*, vii., Dec., 1899, p. 15.

† *Arch. f. Laryngol.*, xiii., 1903, S. 1; see also Jonathan Wright, *Laryngoscope*, xix., 1909, No. 8, p. 592.

more than three years, and is usually between one and two. It may, occasionally, extend over several years.*

The rate of growth depends on the situation of the neoplasm, as well as on its pathological structure. Intrinsic cancer is slower in development, as it remains for some time—often a year and more—limited within the walls of the larynx (cf. Plate XVIII., Fig. 1, facing p. 520). Once these have been broken through, and in all cases of extrinsic cancer, the involvement of the glands and invasion of neighbouring tissues is more rapid, and the prognosis becomes very grave. As regards the prognosis of treatment, extrinsic cancer is only amenable to extensive operations, feasible in a limited number of cases, and only rarely radically successful. If intrinsic cancer comes under notice early, and the patient's general health is satisfactory, the prognosis of lasting cure by operation is better than in any other part of the body. The more centrally the growth is situated, the better is the prospect. Numerous statistics show 70–80 per cent. of lasting cures, with a fair, even a good voice.† If an intrinsic malignant growth is not completely removed by laryngo-fissure, the progress of the disease is decidedly hastened by the operation.

Treatment.—The only radical treatment is excision of the tumour with a surrounding area of healthy tissue. Unfortunately, the situation of the growth, or its extent when it first comes under observation, does not always allow of this. We may consider the cases as they appear suitable for: (1) Intralaryngeal excision, (2) thyrotomy (laryngo-fissure), (3) partial laryngectomy, (4) subhyoid pharyngotomy, (5) total laryngectomy, and (6) palliative treatment (a) by medication—cleansing lotions, insufflations, anodynes, etc.—or (b) by tracheotomy.

1. Intralaryngeal excision.—Although in some exceptional cases satisfactory results by this method have been recorded,‡ it cannot be recognized. Malignant growths, when handled and inspected directly, are always found to be more extensive than

* Gleitsmann, *Trans. Amer. Laryngol. Assoc.*, 1896.

Harmon Smith, *Laryngoscope*, xx., 1910, No. 2, p. 138.

J. Garel, *Soc. Franç. d'Oto-Laryngol.*, 1910.

† F. Semon, *Brit. Med. Journ.*, Feb. 2, 1907, p. 241.

StClair Thomson, *Brit. Med. Journ.*, 1912, i., Feb. 17.

E. Schmiegelow, *Lancet*, 1914, ii., Aug. 1, p. 300.

‡ B. Fraenkel, *Deut. med. Woch.*, xv., 1889, Nos. 1 to 6, S. 1 to 109.

B. Fraenkel, *Arch. f. Laryngol.*, vi., ii., 1897, S. 361 to 374.

Arslan, *Arch. Ital. di Otologia*, xii., 1901, fasc. 2.

Arslan, *Ann. des Mal. de l'Oreille*, xxx., i., Fév., 1904, p. 130. (Gives an analysis of recorded cases. Two personal cases, confirmed by the microscope, remained well after four years and twenty months respectively.)

Finder, *Journ. of Laryngol.*, xxv., 1910, No. 11, p. 602.

F. Semon, *Brit. Med. Journ.*, June 4, 1887.

StClair Thomson, *Lancet*, 1914, i., May 30.

would be guessed from their reflection in the laryngeal mirror. It must be difficult, and generally impossible, to remove a sufficient area of healthy tissue, and valuable time may be lost while the growth is being irritated during a piecemeal removal. (Fig. 242).

2. **Thyrotomy or laryngo-fissure.**—The first efforts to eradicate malignant disease by thyrotomy were far from successful. Eight cases of laryngeal cancer were operated on by laryngo-fissure for carcinoma in Billroth's clinic between 1870 and 1884. In one there was no recurrence after two years and nine months ;



Fig. 242.—Epithelioma of the larynx in a female.

A large mass was removed by indirect laryngoscopy for microscopic observation. At the subsequent laryngo-fissure more of the soft tissues of the right endolarynx were removed, but when submitted to the microscope they showed no extension of malignant disease. The patient remains free from any recurrence, now three years after operation.

in another case the after-history was wanting ; and the other six died of recurrence.* Paul Bruns recorded nineteen cases, of which only two survived a year.† Morell Mackenzie, in referring to these statistics, concludes that "the results of thyrotomy are extremely unsatisfactory."‡ A. E. Durham was one of the first to show that the difficulties and dangers of the operation were greatly over-estimated, and that laryngo-fissure should be more readily resorted to in appropriate cases.§ Curiously enough, observers who have since achieved brilliant results by this very operation were at

first hopeless about it. Thus, in 1883, Butlin, from the results of other operations, concluded that "the disease is far too deeply seated to admit of removal by so slight an operation";|| in 1886, Semon, on the strength of literary information, formed the opinion that it should not be attempted;¶ and Moure, in 1891, concluded that thyrotomy appeared a bad operation in established laryngeal cancer.**

* F. Salzer, *Langenbeck's Arch. f. klin. Chirurgie*, xxxi., 1885, p. 848.

† "Die Laryngotomie zur Entfernung intralaryngealer Neubildungen." Berlin, 1878.

‡ "Diseases of the Throat and Nose," i., p. 341. 1880.

§ *Med.-Chir. Trans., London*, lv., 1872, p. 17.

|| "Essay on Malignant Disease of the Larynx," pp. 56, 57. London, 1883.

¶ Heath, "Dictionary of Practical Surgery," 1886, i., p. 897.

** *Rev. de Laryngol.*, xi., ii., 1891, No. 21, p. 641.

The operation of splitting the larynx for the excision of laryngeal cancer has been chiefly developed by the work of Semon, Butlin, Chiari, Koschier, Moure, Schmiegelow, Delavan, and Chevalier Jackson. It is particularly indicated in the intrinsic form, and the most favourable cases are those in which the disease is limited to one vocal cord, and, preferably, the anterior portion. Good results are even obtainable if the disease has spread across the anterior commissure, so that all one cord and a portion of the other have to be excised (Plate xviii., Fig. 7, facing p. 520). It is still the operation to be recommended so long as the disease appears limited to the soft parts lining one-half of the larynx. "It is only with difficulty that carcinoma makes its way into bone, with still greater difficulty that it makes its way into cartilage, and the chance of recurrence in these hard parts is much less than in the softer tissues."* If, when the larynx is split open, it is found that the disease has travelled farther, it is always possible to convert the operation into a hemi-laryngectomy or a complete excision. The operation is described on p. 788.



Fig. 242a.—Granuloma after laryngo-fissure for cancer of larynx. (From same case as Fig. 242.)

The results of this operation, in properly selected cases, are most satisfactory. I have never lost a patient from the operation, and of my first ten cases there was recurrence in only one instance.† The technique of the procedure has been improved, chiefly by simplifying it, so that, in practised hands, there is little danger from the operation itself. Every case should be regularly inspected once a month for a year afterwards, as a local recurrence may be successfully treated and a permanent cure obtained.‡ The discovery of a soft, red tumour in the larynx within a few months after thyrotomy—over the scar or in the anterior commissure—need not indicate a recurrence of the original growth. In most cases it is a simple granuloma which can be satisfactorily dealt with by intralaryngeal removal (Fig. 242a, and Plate xvii., Fig. 2, facing p. 510). As to the period when a patient

* Butlin, *Brit. Med. Journ.*, Aug. 23, 1890.

† StClair Thomson, *Brit. Med. Journ.*, 1912, i., Feb. 17.

‡ Moure, *Rev. Hebd. de Laryngol.*, xviii., ii., 1898, No. 43, p. 1265; and Soc. Franç. de Laryngol., Mai, 1898.

Semon, *Proc. Roy. Soc. Med.*, Laryngol. Section, vol. ii., Nov., 1908, p. 6.

may be looked upon as "cured" after an operation, the observations of Semon have convinced him that no recurrence need be feared if the patient has remained well for a full year after operation.* Still, a case is reported by D. Newman in which no recurrence occurred until three years after thyrotomy; and after a second thyrotomy, four years elapsed before epithelioma again appeared.† Tilley has shown a specimen of a larynx from which an epithelioma of one cord was removed by laryngo-fissure. The patient had enjoyed good health for thirteen years, and then died from a similar growth on the opposite cord.‡

In nearly all cases a fair voice—slightly rough, perhaps—is left, for a new cicatricial cord forms, which in some instances so closely resembles the original that at first glance it is not always easy to say which was the side operated on. The cicatricial new cord, however, is nearly always quite immobile.

3. Partial laryngectomy.—If, when the larynx has been opened, it is found that the disease has gone beyond the soft parts and invaded the cartilages, and yet has not spread to the pharynx, the operation can be continued by removing, partially or entirely, one side of the cartilaginous larynx. The risks of this operation are much greater than those of laryngo-fissure, and even of total excision. For, once the cartilaginous barrier has been broken down, the glands and the pharynx are so rapidly invaded that it is generally found that a still more complete operation is required. With a hemi-laryngectomy it is also more difficult to protect the patient from septic pneumonia (p. 793).

In 56 cases of partial laryngectomy, 15 died from the operation, 8 from pneumonia, 1 from sepsis, 1 from exhaustion, and 4 from other causes, making a total of 29 deaths, or over 50 per cent., from the immediate effects of the operation.§

4. Subhyoid or transhyoid pharyngotomy.—This operation is indicated in growths involving the epiglottis, the ary-epiglottic fold, or the neighbouring base of the tongue.

A curious fatality is said to attend this operation,|| for the post-mortem often gives no explanation of the matter. According to Sendziak, in more than 50 per cent. of the cases of laryngeal cancer operated on by subhyoid pharyngotomy, death has ensued. Sepsis possibly takes place through the connective-tissue planes, and it would be well to treat the operation wound by a more open method,

* *Journ. of Laryngol.*, Sept., 1903, p. 473. (Brit. Med. Assoc. Meeting.)

† *Proc. Laryngol. Soc., London*, v., March, 1898, p. 62.

‡ *Proc. Roy. Soc. Med.*, Laryngol. Section, Dec., 1909, p. 33.

§ D. B. Delavan, *Journ. of Laryngol.*, xv., Dec., 1900, p. 645.

|| Semon and Butlin, *Proc. Laryngol. Soc., London*, v., Feb., 1898, p. 50.

i.e. suturing the mucous membrane, but packing the wound with gauze for two or three days. But in selected cases the operation is satisfactory and the results are lasting.*

There need be no fear, in removing the epiglottis, that any difficulty in swallowing will result. It has been shown that this body does not act like a lid to the larynx during deglutition, as was formerly taught.†

5. **Complete laryngectomy.** — This operation, first performed by Billroth,‡ soon fell into disrepute on account of the great frequency with which fatal septic pneumonia (*Schluckpneumonie*) ensued from the passage of food, blood, and secretions into the lungs. Among the first 25 cases of total extirpation performed for cancer of the larynx, not one of the patients was alive at the end of the first year after operation.§ In recent years much better results have been obtained, particularly in so far as immediate danger from the operation is concerned, by adopting Solis-Cohen's method of completely severing the trachea and detaching it from the larynx, pharynx, and œsophagus. The orifice of the trachea is then secured to the skin in the middle of the neck. The operation is described at p. 794. All communication between the nose or mouth and the trachea being thus permanently interrupted, the danger of septic pneumonia is removed, although the risks of the operation are not inconsiderable. Apart from the shock of such an operation, and the possibilities of hæmorrhage and sepsis from the large pharyngeal wound, the removal of the larynx appears to have a peculiar mental effect in certain cases. Some cases have developed acute mania, while others have succumbed to melancholia, and at least four cases are on record in which the subject of a so-called successful laryngectomy has committed suicide.||

In those patients who recover, "laryngectomy usually results in death within three years, even although recurrence may not have taken place."¶ If they remain free from recurrence they must remain somewhat crippled for life. Their lungs have no longer the protection afforded by the passage of inspired air through the nose; without a glottis they have difficulty in expectorating and in clearing the nose or trachea; while the complete absence of vocal cords prevents them from fixing their chest for many of the

* Albert Carless and StClair Thomson, *Trans. Med. Soc., London*, xxv., 1902, p. 366. (No recurrence after eighteen months.)

† Knowles Renshaw, *Brit. Med. Journ.*, July 19, 1902.

‡ *Arch. f. klin. Chirurgie*, Bd. xvii., Heft 2, p. 343.

§ Foulis, *Trans. Internat. Med. Congress, London*, 1881, iii., p. 251.

|| D. B. Delavan, *Brit. Med. Journ.*, Oct. 26, 1895.

¶ D. B. Delavan, *N.Y. Med. Journ.*, Oct. 14, 1893.

actions required in everyday life. This latter is an important consideration with patients of the labouring class; it is generally impossible for them after this operation to gain their living by manual labour. At first all patients feel deeply the deprivation of voice. But this is not necessarily permanent; many acquire a serviceable voice by evolving a plan by which air is swallowed into the pharynx and serves for phonation as it is evacuated. Or, by an ingenious design by Gluck, the air from the cervical orifice of the trachea in the neck is conveyed to the mouth.

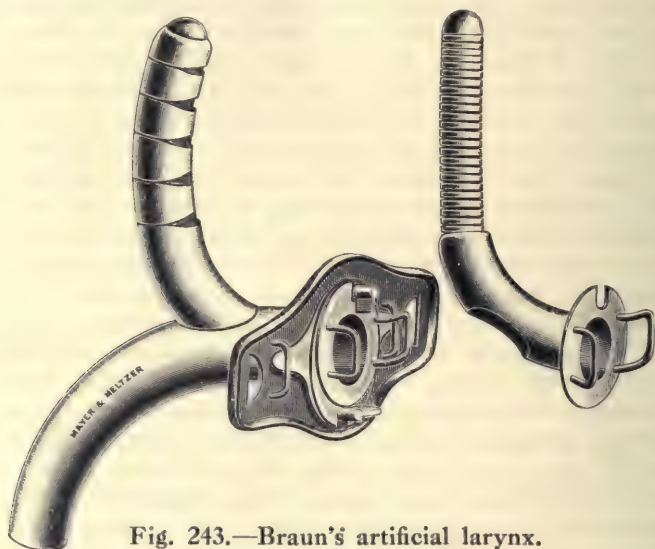


Fig. 243.—Braun's artificial larynx.

In one case, although I fixed the divided end of the trachea to the front of the neck, yet I maintained a fistulous communication between the neck wound and the laryngo-pharynx. Into this a Braun's artificial larynx was inserted, and the patient can now breathe through the nose, talk in a loud whisper, walk for miles, and even ride a bicycle—five and a half years after the operation.* (Fig. 243.)

In some cases the operation has to be extended so as to remove part of the pharynx or tongue.†

The indications for this operation will be based on ascertaining that the extension of the disease is still within the possibility of excision, and will depend on the age, general health, and resist-

* *Proc. Roy. Soc. Med., Clin. Section*, Feb., 1910.

† Gluck, *Journ. of Laryngol.*, xxv., 1910, No. 11, p. 601.

ing power of the patient, and on the special skill of the surgeon. The dangers and sequelæ of the operation must be explained beforehand.*

6. **Palliative treatment.**—In a large number of cases no curative operation can be considered. Many of these are cases of extrinsic cancer, in which extension to the pharynx or tongue or involvement of the glands takes place early; others are intrinsic cases which come under observation too late; some are cases in which the age or the health of the patient renders an operation undesirable; and others are instances in which the patient or his friends have declined an operation or deferred its acceptance until too late.

(a) Much can be done to assuage the pitiable conditions of such patients. The dysphagia resulting from disease of the epiglottis may be relieved by removing as much as possible with the galvano-cautery snare or by morcelllement.† With increased difficulty of swallowing, gastrostomy may be required. If respiratory obstruction supervenes, a low tracheotomy should be performed before it becomes marked. Considerable temporary improvement, both general and respiratory, is apt to follow it. The teeth and mouth should be kept as clean and aseptic as possible, and, as soon as ulceration commences, alkaline cleansing lotions or sprays, with the addition of sanitas, weak carbolic lotion, chinosol, lysol, or peroxide of hydrogen, should be inaugurated, followed by insufflations of some antiseptic powder, such as euophen or aristol. Iodoform is one of the best deodorants; but its nauseous odour is apt to disgust both the patient and those around him. Lozenges of formalin, carbolic, or menthol also assist in the great object of keeping the area as antiseptic as possible. Hæmorrhage, and even pain, may be relieved by the application of adrenalin.‡

With regard to anodynes: in the early stage of dysphagia some relief may be obtained by insufflations of orthoform (Formula 4). Weak sprays of cocaine (2 to 3 per cent.) may assist in the ingestion of food, but the disagreeable paræsthesia induced is apt to disconcert the patient and make him dread that food will "go the wrong way." Most cases eventually require heroin or morphia, which can be given in the form of a tablet

* "I am not a supporter of the operation when the growth has become extralaryngeal and glands are present. Indeed, I consider that when the lymphatics are invaded these cases are not inoperable, but that they will almost certainly have recurrence."—Moure, *Ann. des Mal. de l'Oreille*, xl., 1914, No. 6, p. 606.

† Tilley, *Proc. Laryngol. Soc., London*, Dec. 5, 1902.

‡ G. Mahu, *Ann. des Mal.*, xxx., 1904, No. 3, p. 256.

Peters, *Lancet*, 1910, i., p. 619.

dissolved in the mouth, or as a laryngeal insufflation (Formula 6), or as a hypodermic injection. The last is generally the most satisfactory way. Quite a small dose (gr. $\frac{1}{2}$) will be sufficient at first, but as the need for the drug or tolerance of it increases it should be given with no grudging hand. The neuralgic pains, particularly those spreading to the ear, may sometimes be checked by aspirin, phenacetin, antipyrin, chloral, or other nerve sedatives.

Constipation and septic gastro-enteritis must be guarded against, and the general condition of the patient maintained by open air, careful diet, nursing, and hygiene.

(b) *Palliative tracheotomy*.—This operation may have to be considered for the relief of respiratory obstruction in cases where the patient has declined more curative measures, and where the situation and stage of the growth render more radical measures hopeless. It should be performed as low in the neck as possible to avoid risk of the growth spreading to the tracheotomy wound. It should also be done early, as soon as any real difficulty in breathing is observed. If it is postponed till obstruction is very marked, infective bronchitis may have already started and be acutely aggravated by the operation.

(c) Radium has not proved to be of much benefit in carcinoma of the larynx.

(d) Diathermy may give relief, and in epithelioma of the epiglottis or postcricoid region this may be sufficient to postpone considerably the necessity for a gastrostomy.* For its application the use of suspension laryngoscopy may be a help (cf. p. 49).

* E. P. Cumberbatch, *Arch. of Roentgen Ray*, March, 1915.

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CHAPTER XXXVIII

NEUROSES OF THE LARYNX

PHYSIOLOGY OF THE LARYNX

Functions of the larynx.—The two principal functions of the larynx are respiration and phonation.

(a) Respiration is essentially an automatic act, under the control of a centre in the medulla oblongata. This bulbar centre, in the dog, suffices for respiration after complete removal of the cerebral hemispheres. It is continually acting without volition, but has not complete independent control; for since respiration is also represented in the cortex, it can be modified, but not suppressed, by voluntary effort.

(b) Phonation, on the other hand, is strictly under the control of the will, with nerve centres represented in the cerebral cortex. Phonation only escapes from volition exceptionally in certain reflex acts—laughing, sighing, sobbing, coughing, hiccoughing, and cries of fright, and these acts are mainly represented in the bulbar centres. To put it briefly, we breathe from our medulla and we speak from our cerebral cortex.

Action of the vocal cords.—For phonation we have the two vocal cords, which vibrate with expired air when brought together by the adductor or phonatory muscles, under the force of the will. Another group, the respiratory, serve to keep the cords sufficiently separated for breathing purposes, the space slightly enlarging and diminishing with each inspiration and expiration, and becoming very marked with a forced inspiration. When, in death, both phonation and respiration have finally ceased, the cords come to rest in a characteristic attitude (Fig. 247); this leaves a space half the size of that of quiet respiration. The free passage of air through the larynx is assured by the "abductor tonus," a partial contraction of the posticus muscle, which can be increased or relaxed for deeper respiration or for phonation, but immediately afterwards assumes its tonic action.*

Thus there are four principal positions in which the cords may be found: (1) phonation (Fig. 244); (2) ordinary respiration (Fig. 245); (3) deep inspiration (Fig. 246); and (4) the cadaveric position (Fig. 247). These positions are altered in laryngeal paralysis, according

* F. Semon, *Brit. Med. Journ.*, i., Jan. 1, 1898, p. 1.

as one or, more commonly, a group of muscles is affected, and as the affection is bilateral or one-sided.

Intrinsic muscles of the larynx.—The cords are moved to and fro, and held in their various positions, by the intrinsic muscles of



Fig. 244.—The larynx during phonation.

The cords are approximated in the middle line, and the epiglottis is tilted upwards and forwards. The movement of phonation is therefore employed for bringing into view the anterior commissure and the laryngeal surface of the epiglottis.

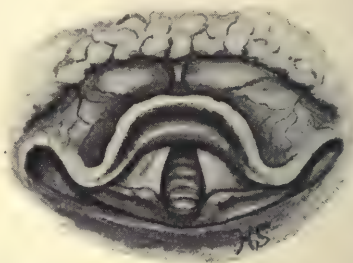


Fig. 245.—Position of the vocal cords in quiet respiration, i.e. midway between phonation and deep inspiration.

Note that the epiglottis is pendulous, and that the anterior commissure is frequently not visible during respiration, and is only brought into view on phonation. (Cf. Fig. 244.)

the larynx, which fall into two principal groups—(a) the adductor muscles, which are chiefly concerned in phonation, and close the glottis; (b) the abductor muscles, which are concerned in respiration, and open the glottis.

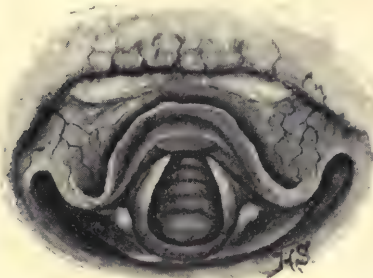


Fig. 246.—The larynx in deep inspiration, the cords being abducted as widely as possible.

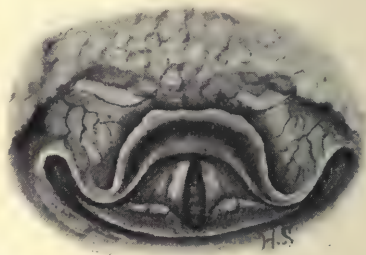


Fig. 247.—The vocal cords in the cadaveric position, i.e. midway between that of quiet respiration and that of phonation.

(a) **Adductor muscles.**—The chief muscle is the crico-arytenoideus lateralis (Fig. 248, A), which draws forward the muscular process of the arytenoid cartilage and so brings the cords parallel. It is supplied by the recurrent laryngeal nerve. The interarytenoideus completes the action of the last muscle by approximating and fixing the posterior ends

of the cords (Fig. 224, B); it receives motor twigs from the recurrent laryngeal nerves of both sides. Bands of muscle are prolonged in the ary-epiglottic folds to close and protect the aditus ad laryngem. The thyro-arytenoideus internus, attached along the lower border of the vocal cord, gives it variety in outline, thickness, and tension. It is supplied by the recurrent laryngeal nerve.

The crico-thyroid muscle acts by pulling upwards the anterior border of the cricoid cartilage, and so rendering the cord more tense. It is supplied by the superior laryngeal nerve—the only muscle supplied by this nerve. (Some anatomists are of opinion that the cricoid remains fixed, and that the muscle pulls down the anterior margin of the thyroid cartilage. These views are immaterial, as, in either case, the result is to increase the tension of the cord.)

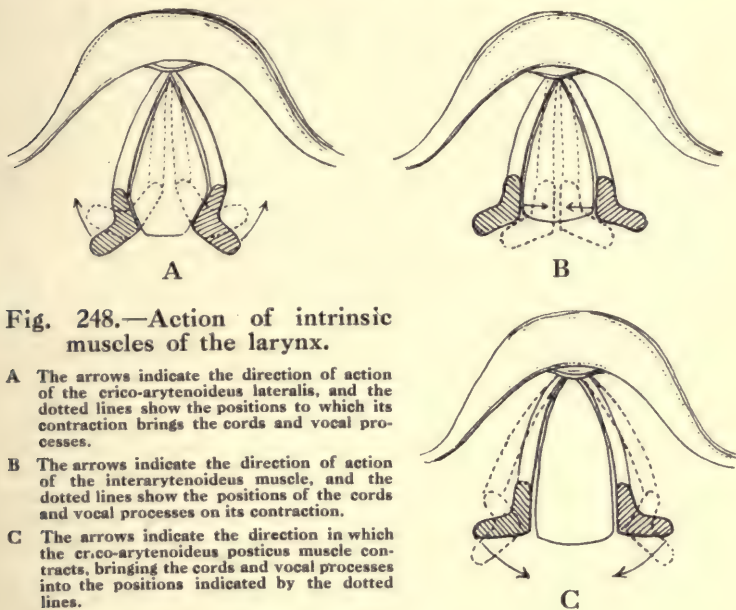


Fig. 248.—Action of intrinsic muscles of the larynx.

- A The arrows indicate the direction of action of the crico-arytenoideus lateralis, and the dotted lines show the positions to which its contraction brings the cords and vocal processes.
- B The arrows indicate the direction of action of the interarytenoideus muscle, and the dotted lines show the positions of the cords and vocal processes on its contraction.
- C The arrows indicate the direction in which the crico-arytenoideus posticus muscle contracts, bringing the cords and vocal processes into the positions indicated by the dotted lines.

(b) **Abductor muscles.**—The only one is the powerful crico-arytenoideus posticus (Fig. 248, C), which, on each side, tilts backwards the muscular process of the arytenoid cartilage and so opens the glottis. It is supplied by the recurrent laryngeal nerve.

Innervation of the larynx.—Two branches of the vagus innervate the larynx. The superior laryngeal branch supplies sensation to the whole of the mucous membrane, and motion to the crico-thyroid muscle. It also furnishes the vaso-motor and secretory nerve-fibres for the whole of the laryngeal mucosa.

The recurrent laryngeal nerve furnishes motion to all the intrinsic muscles, except the crico-thyroid. It is purely a motor nerve to both the abductor and adductor muscles. The fibres to the former are collected in one bundle on the inner side, and those for the adductors

on the outer side of the nerve trunk.* But the superior laryngeal nerve (like the vagus trunk as far as the inferior ganglion) contains both afferent and efferent nerve fibres to the larynx. Hence irritation or compression of the superior laryngeal nerve, or of one vagus, may be reflected from the bilateral centre in the medulla and excite contraction of both cords. A lesion of the purely motor recurrent laryngeal nerve can only produce paralysis (at first only an abductor palsy) of the cord on the same side. This explains why bilateral spasm, and unilateral paralysis, may be caused by an aneurysm of the arch of the aorta compressing the left vagus trunk and the left recurrent nerve.

Course of motor nerves of the larynx.—The recurrent laryngeal nerve, as it supplies all the muscles, with one exception, may be called the motor nerve of the larynx.

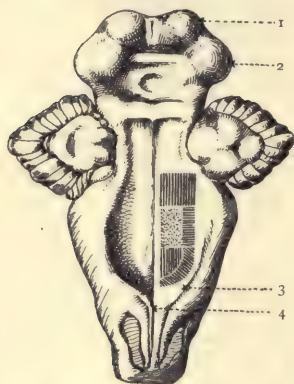


Fig. 249.—Laryngeal bulbar motor centre.

1. Corpora quadrigemina anteriora.
 2. Corpora quadrigemina posteriora.
 3. Calamus scriptorius.
 4. Ala cinerea.
- ||||| Area of bilateral abduction.
 \\\\\ Area of bilateral adduction.
 === Area of unilateral adduction.
 :::: Area of cadaveric position.

(Semon and Horsley.)

It is contained in the vagus trunk from the exit of the latter from the skull at the jugular foramen until it enters the thorax. It therefore lies in the carotid sheath, and is exposed to the same surroundings on both sides of the neck. But after entering the thorax the motor nerve of the larynx follows a different course on the two sides. On the right the recurrent laryngeal leaves the vagus as the latter crosses the subclavian artery, and, winding behind it, the nerve lies on the apex of the right lung and ascends obliquely between the trachea and oesophagus to enter the larynx through the crico-thyroid membrane. On the left side the recurrent laryngeal nerve is more exposed, as it has a longer course. It is only given off from the vagus as the latter crosses the arch of the aorta. Winding round the latter, it passes upwards to the neck, where it follows the same course as on the right side.

Bulbar centres.—Now, following the motor nerve in the opposite direction, the recurrent laryngeal can be traced in the trunk of the vagus to a centre in the medulla oblongata in the floor of the fourth ventricle (Fig. 249). Here a lesion involving one centre would affect only one vocal cord, viz. the one on the same side.

Cortical centres.—Finally, the cortical centres, on each side, presiding over the motion of the cords have been located in the prefrontal gyrus of the dog (Krause), † just posteriorly to the lower end of the precentral sulcus, at the base of the third frontal gyrus in the monkey, and in the precrucial and neighbouring gyrus in the carnivora (Semon and Horsley) (Fig. 250). Stimulation of the focus of intensest

* Risien Russell, *Proc. Roy. Soc.*, vol. li.

† *Arch. f. Anat. u. Physiol.*, 1884, S. 203.

representation (anterior half of the front of the ascending frontal convolution) produces complete bilateral adduction of the cords. Close in front of, and below this spot, stimulation can be made to produce abduction, but with greater difficulty (Risien Russell), the reason being that the more powerful glottis-closers overcome and conceal the concomitant dilator irritation.

The connecting fibres between the cortical and bulbar centres run through the internal capsule.

Functions of the cortical centres.—Well-established experiments on dogs and monkeys have furnished the following results:—

1. Unilateral irritation of one cortical centre causes bilateral movement.

2. This movement is one of adduction, never of abduction, i.e. it is the movement of purposive phonation. Abduction, or the more automatic movement of respiration, is mainly represented in the medulla.

3. The destruction of one cortical centre produces no result; the opposite centre continues to act equally on both sides.

4. Therefore, only destruction of the cortical centres on both sides would produce paralysis.

Now the likelihood of precisely corresponding cortical lesions is so remote that paralysis from such a possibility may be clinically ignored, and this explains why, even in right-sided hemiplegia with complete aphasia, no authentic case of unilateral laryngeal paralysis has ever been recorded. When, therefore, paralysis of the larynx is of organic and central origin, it is practically certain that it is due to a bulbar lesion, and not to disease of the cortex.

Greater vulnerability of the abductor muscles (Semon's law).

—Both abductor and adductor muscles are supplied by one nerve trunk, but the fibres for each set of muscles are separable into two distinct strands of fibres, both in the recurrent nerve (Risien Russell) and in the internal capsule (Semon and Horsley). It is a remarkable fact, first noticed by O. Rosenbach in 1879, in regard to compression of the recurrent, but only fully established by Semon in reference to all organic lesions of the centres or trunks of the motor nerves, that the fibres going to the abductor muscles are first involved, and that the adductors continue to act for a variable time.* In a progressive organic lesion

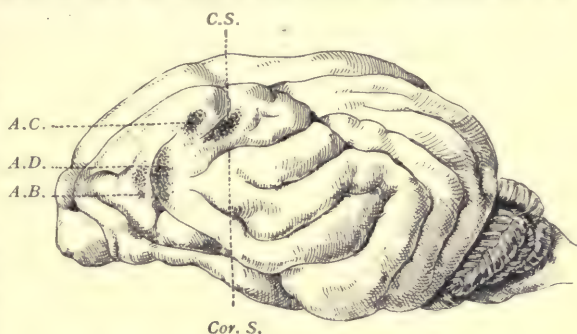


Fig. 250.—Laryngeal cortical motor centre.

C.S., Sulcus crucialis; Cor. S., sulcus coronaris; A.B., area for abduction; A.D., area for adduction; A.C., area for acceleration. (Semon and Horsley.)

* O. Rosenbach, *Breslauer aerz. Zeitschr.*, 1880, Nos. 2 and 3.
O. Rosenbach, *Berl. klin. Woch.*, 1906, No. 46.
F. Semon, *Arch. of Laryngol.*, ii., 1881, No. 3, p. 197.

the muscles are affected in the following order: (1) the abductors, i.e. the crico-arytenoidei postici (posticus paralysis); (2) the tensors, i.e. the thyro-arytenoidei interni; (3) the adductors, i.e. the crico-arytenoidei laterales. Unless, therefore, the lesion is so gross that complete paralysis occurs at once, the abductors are for a time the only muscles affected. In recovery from complete paralysis the reverse order is observed.

This greater vulnerability of the abductors is known as Semon's law, and to explain it he has suggested (1) "that there exists an actual difference in the biological composition of the laryngeal muscles and nerve-endings," and (2) that "similar differentiations exist in the nerve nuclei themselves." * Ferrier contends that it is only an instance of the more general law that the nerves of the extensor muscles, from mixed motor nerves, are more vulnerable to destructive influences than those of the flexors and adductors.† But the ultimate cause of the greater vulnerability of the abductors is still unknown.

CLASSIFICATION

Neuroses of the larynx may be divided into three groups: (A) neuroses of sensation, (B) neuroses of motion, and (C) neuroses of inco-ordination.

A. **Neuroses of sensation** include anæsthesia, hyperæsthesia, and paræsthesia.

B. **Neuroses of motion** can be grouped as follows:—

(1) Spasmodic or hyperkinetic neuroses; exaggeration of normal activity. They include (a) glottic spasm, and (b) rhythmical clonic spasm of the adductors. Formerly authors included in this group congenital laryngeal stridor and laryngismus stridulus. The former is no longer regarded as a neurosis, and it will be seen that there are reasons for transferring laryngismus stridulus to another section.

(2) Paralytic or hypokinetic neuroses.

C. **Neuroses of inco-ordination**, or parakinetic neuroses. These deviations from the normal are not common. The group includes choreic movements, phonic spasm, nervous laryngeal cough, and laryngeal vertigo.

This classification is necessary for purposes of study, but some nervous diseases affect simultaneously both sensory and motor branches.

Another group might have been formed of diseases which are a perversion rather than an exaggeration or diminution of normal activity, and an affection like laryngeal vertigo is midway between troubles of sensation and motion.

* An exception to Semon's law is published by R. Saundby and J. T. Hewetson, *Brit. Med. Journ.*, March 12, 1904.

† *Proc. Roy. Soc. Med.*, Laryngol. Section, May 2, 1913.

A. NEUROSES OF SENSATION

Disorders of sensation may be considered under the groups of (a) anæsthesia, (b) hyperæsthesia, and (c) paræsthesia.

(a) ANÆSTHESIA

As every laryngologist knows by experience, there is much individual variety as to the exaltation or diminution of sensation in the throat; some patients are very tolerant. But we are now only considering decided diminution of sensation in truly pathological conditions.

Etiology.—The causes may be (1) peripheral, (2) in the nerve-trunks, (3) in the central nervous system.

(1) In anæmia and in old age diminished sensibility is sometimes detected. It is well to remember that sensation is dulled or abolished by cocaine, eucaine, novocaine, alypin, orthoform, anæsthesin, menthol, ice, morphia, bromides, chloral, ethyl chloride, and chloroform. Anæsthesia is met with in some general affections, such as influenza, typhus, cholera, and pneumonia.

(2) Of affections of nerves, the most common cause is the peripheral neuritis of diphtheria. Anæsthesia also occurs in cases where the superior laryngeal nerve or its centre is affected, and is frequently associated with motor paralysis of laryngeal muscles. Lesions of other cranial nerves often coexist. Hemianæsthesia may occur with tumours at the base of the skull.

(3) Amongst central affections which may produce anæsthesia are the bulbar lesions in locomotor ataxy, general paralysis, glosso-labio-laryngeal paralysis, syringomyelia, multiple sclerosis, and in hæmorrhages, tumours, and gummata. It occurs to a slight degree in hysteria, and in epilepsy just before the seizure.

The chief **symptoms** are difficulties with deglutition. The anæsthesia may be partial or complete; unilateral or bilateral, or confined to only one portion of the larynx.

Diagnosis is founded on the symptoms and settled by testing the insensibility of the larynx to the probe. It is important not to overlook coexisting paresis and anæsthesia in the pharynx or palate, or any evidence of incipient central nerve disease.

Prognosis.—If the anæsthesia is bilateral and complete, or of central origin, the prognosis is grave, owing to the risk of food entering the larynx and setting up pneumonia. When due to peripheral neuritis—generally diphtheritic—recovery takes place in one to six weeks.

Treatment.—In slight cases swallowing should be carried out slowly and with much circumspection. If the anæsthesia is marked,

deglutition becomes impossible, and the patient must be fed through the nose with a soft rubber stomach tube. Owing to the insensitiveness of the larynx the tube might easily pass down the trachea. After its insertion, therefore, and before any food is introduced, this point should be settled by making the patient phonate or by examining him with a laryngoscope.

Iron, strychnine, or mercury and iodide of potassium should be given, according to the case. Diphtheritic cases should be kept at rest in bed, and the faradic current applied externally (*see* p. 722).

(b) HYPERÆSTHESIA AND (c) PARÆSTHESIA

Excessive or perverted sensation may be manifested by cough, pain, tickling, itching, burning, pricking, tightness, rawness, or the feeling of a foreign body, which induces hawking and hemming.

Etiology.—Among the causes are abnormal conditions of the general nervous system, as in anæmia, hysteria, neurasthenia, fatigue (physical, vocal, or mental), dyspepsia, and excess of alcohol. The phenomena accompany acute or chronic laryngitis, and are frequently met with at the menopause, in hypochondriacs, and in the victims of a dread of tubercle, syphilis, or cancer. A reflex cause may not uncommonly be traced in the tonsils (pharyngeal, faucial, or lingual), nose, ears, teeth, or thyroid gland.

Diagnosis is based on the exclusion of any organic causes, such as gout, rheumatism, or early tabes. It should be remembered that, as Schadowaldt pointed out, the localization of sensation in this region is vague, so that the feeling produced by a tracheal, œsophageal, tonsillar, or postnasal lesion is often referred to the front of the larynx. Hyperæsthesia is perhaps most commonly met with as an early indication of tuberculosis, and next in frequency comes its association with hysteria, alcoholism, gout, and conditions producing local congestion.

Prognosis depends on the cause, and on the age, sex, and habits of the patient. These disorders of sensation may be very persistent, and sufferers frequently fall victims to quackery.

Treatment.—It is well to avoid much local treatment, especially the frequent use of the galvano-cautery and cocaine. A light touch of the cautery might be given once or twice, if it is kept in mind that here it acts chiefly by suggestion. A sedative lozenge containing carbolic, menthol, bromide, or krameria may be given. It is important to give the patient confidence, reassure him as to the absence of local lesions, and insist on the necessity of general treatment together with attention to diet, hygiene, exercise, and baths. Tonics of iron or arsenic (Formula 58), change of

air, local massage, the use of the constant current, may prove useful, and a visit to Ems, Mont Dore, or Cauterets is frequently of service if the patient insists that his symptoms are "throaty." If he is gouty or rheumatic he will derive benefit from Harrogate, Bath, Aix-les-Bains, Vichy, or other suitable spring.

B. NEUROSES OF MOTION

I. SPASMODIC OR HYPERKINETIC NEUROSES

(a) GLOTTIC SPASM IN ADULTS

Etiology.—The causes may be (1) local irritation; (2) irritation of the motor nerves; (3) central nerve lesion; (4) hysteria or functional disorder.

(1) In the majority of cases glottic spasm is a reflex phenomenon due to direct irritation of the larynx or pharynx, such as may occur in examination or treatment, the penetration of foreign bodies or gases, catarrhal, inflammatory, or ulcerative conditions, neoplasms, tuberculosis, hypertrophy of Waldeyer's ring, elongated uvula, and gouty or rheumatic pharyngitis.

(2) Any lesion which irritates the recurrent laryngeal nerve in the neck, or, on the left side, in the mediastinum, may excite spasm. Hence it may be caused by aneurysm, tumours or cancerous growths in the mediastinum or œsophagus, glands in the neck or in the mediastinum, goitre, tubercular glands, or tubercular pleuritic adhesions over the right apex.

(3) The central nerve lesion which most commonly produces spasm is that of locomotor ataxy. It may produce laryngeal crises, analogous to gastric crises, and these may be amongst the earliest symptoms of tabes and precede any paralysis. Glottic spasm may also occur in tetany. In hydrophobia there is spasm of the abductors.*

(4) Hysterical spasm is a well-known form of functional inspiratory glottic spasm in adults. It may be associated with globus hystericus, œsophagismus, strangling or choking sensations, or cough. This form is apt to be obstinate, recurring on the slightest provocation, and sometimes without any evident cause. Functional spasm occurs in epilepsy. In some cases it is a nasal reflex.

Symptoms.—These to some extent resemble the spasm of laryngismus stridulus. During the day the patient is generally conscious of the coming attack and assumes the erect posture, seizes hold of some object, or rushes to the window "for air."

* G. Newton Pitt, *Guy's Hosp. Repts.*, vol. xxvii., i, 1884, p. 361.

A few hurried, shallow, noisy inspirations are drawn with increasing stridor and difficulty and then either continued more slowly, laboured and stridulous, or else they culminate in complete closure of the glottis, during which the agonized expression of the patient presents many of the symptoms of asphyxia. The glottis may partially open from time to time to allow of shallow respiration. Complete unconsciousness seldom occurs, although it may be feigned in hysterical subjects. In many cases the patient is able to converse, and he uses his utmost effort to follow directions to overcome the spasm by taking quiet, rapid, shallow, and regular inspirations. At night the attack is apt to be more alarming, as the patient generally springs from bed to clutch on to some object and exclaim, between his noisy efforts at filling his lungs, that he is choking. When associated with a brassy cough, attacks of glottis-spasm in a patient who is not hysterical should suggest the possibility of an early condition of aortic aneurysm or mediastinal growth.

There is a more chronic form in which inspiratory stridor is more or less constant except in sleep, with exacerbation under any physical exertion or any emotional disturbance such as a laryngoscopic examination. The cords are then seen during inspiration to remain in close proximity, and the appearance might be mistaken for double abductor paralysis. In reality it is produced by adductor or inspiratory spasm. To detect this the patient should be requested to phonate as long as possible without stopping; the need of air will make him take a deep respiration, when the cords will be seen to abduct widely. He sometimes eludes this test, and then the only plan is to administer a general anæsthetic and observe the movements of the cords by direct laryngoscopy (p. 46).

Prognosis depends on the cause. The affection is seldom fatal in itself; and tracheotomy, though often threatened, is rarely required.

Treatment.—The attacks may be mitigated by inhaling chloroform or nitrite of amyl. I have had some glass ampoules prepared containing chloroform (℥x), menthol (gr. $\frac{1}{3}$), and iodide of ethyl (℥v). These can be always at hand, and, when required, the glass is readily broken and the contents inhaled. In functional cases the revulsive effect of strong smelling-salts, cold affusion, and suggestion will prove useful. The patient should be ordered to keep the mouth closed and to breathe quietly through the nose.

Between the attacks the exciting cause must receive appropriate treatment. In all cases any source of irritation, such as dust, alcohol, tobacco, indigestion or excitement, should be avoided.

In functional cases the undue sensitiveness may be allayed by bromines and a sedative lozenge (Formulae 42 and 45, p. 808). But the important thing is to treat the patient's general condition by regulating the diet, hygiene, and habits, and eliminating all possible causes. In some inveterate cases I have traced the spasm to the morphia or cocaine habit.

The treatment of spasm of central origin is purely symptomatic, as the primary disease is usually incurable. In tabetic crises, bromides, iodides, chloral, antipyrin, and morphine quiet the excitability of the centre. Tracheotomy may be required.

(b) CLONIC SPASM OF LARYNX

This consists of rhythmical twitchings which may continue for months, and are frequently seen in conjunction with similar spasms in the pillars of the fauces (*see* p. 463). They are said to occur in paralysis agitans, after meningitis, in syphilis of the brain, in pressure on the medulla from tumours of the cerebellum, and in disease of the medulla in the neighbourhood of the accessory nucleus.

2. PARALYTIC OR HYPOKINETIC NEUROSES. LARYNGEAL PARALYSES

Paralysis of an intrinsic laryngeal muscle may be due to (a) a lesion in the cerebral cortex or internal capsule, but only if the lesion is bilateral; (b) a lesion in the medulla oblongata owing to degeneration of the vagus nucleus ambiguus, pressure by growth, or meningeal inflammatory thickenings; (c) pressure or destruction of the motor nerve-fibres in the vagus trunk or its recurrent branch, from intracranial growths, growths at the base of the skull in the neighbourhood of the jugular foramen, in the neck, or in the thorax; (d) peripheral neuritis; (e) disease in the muscles themselves, the so-called myopathic paralyses.

It will be convenient to consider the palsies of the intrinsic muscles of the larynx according as the latter are innervated (1) by the superior laryngeal nerve, or (2) by the recurrent laryngeal nerve.

1. PARALYSIS OF MUSCLES SUPPLIED BY THE SUPERIOR LARYNGEAL NERVE

Synonyms.—*Paralysis of the crico-thyroid muscles; paralysis of the external tensors.*

Etiology.—The only muscle supplied by the superior laryngeal nerve is the crico-thyroid. Its function is to assist in rendering

tense the corresponding vocal cord during phonation (p. 539). Paralysis may result from direct injury (operative) to the nerve, or from its involvement in a new growth or enlarged glands. It may occur in association with anæsthesia of the mucous membrane supplied by this nerve. This is most frequently met with after diphtheria. But, anyhow, this paralysis is of very rare occurrence. Mygind has found only 13 cases in literature, and has himself observed 4.* It has been suggested that the physiological curiosity of "laryngeal whistling" is produced by an unusual control of the crico-thyroid muscles.†

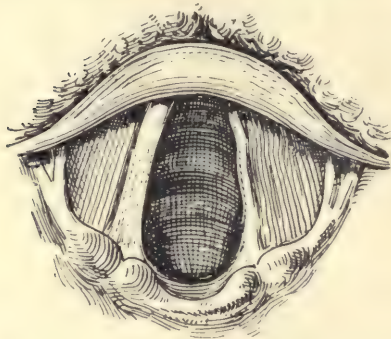


Fig. 251.—Paralysis of crico-thyroid muscle on left side, as seen during respiration.

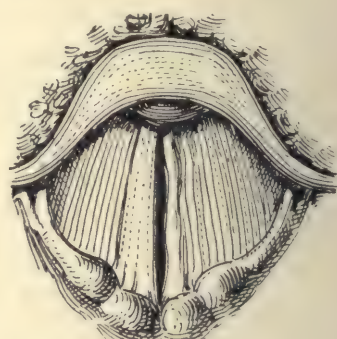


Fig. 252.—Paralysis of crico-thyroid muscle on left side, as seen during phonation.

Symptoms.—When this muscle is paralysed it fails to fix the thyroid on the cricoid cartilage. Consequently, in the absence of a resisting force, the tensor muscles can no longer put the vocal cord on the stretch, and its free margin presents a wavy outline. Owing to the defective tension, the cord bulges upwards in its centre in forced expiration, and is drawn downwards on inspiration, like the flapping of a slack sail. If the finger is placed over the crico-thyroid space, the absence of tension during phonation can sometimes be perceived. An obliquity of the glottis—the anterior commissure being tilted towards the paralysed side—is said by Mygind to be very characteristic. In unilateral paralysis the affected cord appears shorter and higher than the same one during phonation, and in respiration it disappears from view under cover of the ventricular band (Mackenzie). But, according to some observers, the affected vocal cord stands lower than its

* *Laryngoscope*, xix., 1909, No. 5, p. 365.

† F. Semon, *Proc. Laryngol. Soc.*, London, vii., April, 1900, p. 83.

healthy companion.* In bilateral paralysis the rima glottidis may have an irregular, billowy outline (Figs. 251-253).

Reflex irritability is abolished or diminished. The voice is apt to be feeble, rough, toneless, and is easily tired. If the cricoid and thyroid cartilages are approximated mechanically, the voice is immediately improved (Grünwald). An anæsthetic condition of the larynx may be found to coexist.

Prognosis. — Recovery will depend upon the cause. Diphtheritic cases recover, as a rule. If there is anæsthesia of the larynx, the prognosis becomes more serious, owing to the risk of food entering the lungs and setting up pneumonia.

Treatment. — The treatment of the anæsthesia has been referred to (cf. p. 543). The usual treatment for paralysis of the crico-thyroid is the administration of strychnine, and the local use of counter-irritation and faradization.

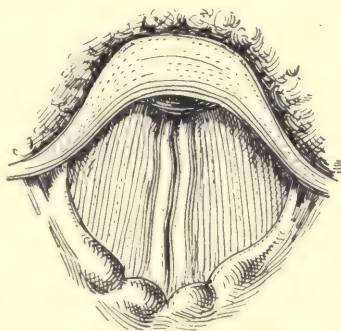


Fig. 253.—Paralysis of crico-thyroid muscle; appearances of bilateral paralysis as seen during phonation.

2. PARALYSIS OF MUSCLES SUPPLIED BY THE RECURRENT LARYNGEAL NERVE

All the muscles of the larynx, except the crico-thyroid, are innervated by the recurrent laryngeal nerve. This section, therefore, treats of paralysis of the following muscles:—

- i. Crico-arytenoidei laterales.
- ii. Arytenoideus.
- iii. Thyro-arytenoidei externi and interni.
- iv. Crico-arytenoidei postici.

These muscles, with the exception of the last-named, are all concerned in the closing of the glottis. It has already been pointed out that in all progressive organic lesions of the motor nerves to the larynx, or of their bulbar nuclei, the abductor fibres are the first to fail (p. 541). Their palsy is followed by that of the internal tensors of the cords, and finally by the adductors. Now, if the adductors or tensors are primarily affected, it is found,

* Riegel, "Ueber Lähmung einzelner Kehlkopfmuskeln," *Deut. Arch. f. klin. Med.*, 1870, Bd. vii.

Semon, *Arch. of Laryngol.*, vol. ii., 1881, No. 3, July. (Case 20.)

Semon, "Heymann's Handbuch der Laryngol.," Bd. i., Erste Hälfte, S. 712-713. Wien, 1897.

with hardly an exception, that the paresis is functional and not organic. It is therefore easily remembered that when the adductors are alone affected we have to do with functional disease; but that when the abductors are first involved the affection is organic.

For clinical convenience, therefore, paralysis of the adductors will be first considered.

A. Paralysis of the Adductors of the Vocal Cords

Adduction of the vocal cords is brought about chiefly by the action of the crico-arytenoidei laterales (p. 539, Fig. 248, A). For complete approximation the arytenoideus and thyro-arytenoidei muscles must also contract (Fig. 248, B.)

i. Unilateral Adductor Paralysis

This form of adductor paralysis, which can only be brought about by purely local causes, would produce an appearance similar to that shown in Fig. 257, p. 559. It will be observed that the condition would be liable to be mistaken for complete paralysis of one cord. If the adductor paralysis were complete, then the over-action of the crico-arytenoidei postici would maintain the cord in full abduction, with a concave border. But if incomplete, some further abduction would take place on deep inspiration.

It is extremely rare. It is said to have arisen from cold, syphilis, enteric, typhus, and smallpox. Mackenzie observed unilateral adductor paralysis in a case of lead-poisoning. But unilateral want of adduction is, practically, only produced by local causes.

ii. Bilateral Adductor Paralysis

Synonyms.—*Functional aphonia*; *hysterical aphonia*; *nervous aphonia*.

Etiology.—Functional aphonia, in the majority of cases, is due to hysteria, and occurs chiefly in young women, sometimes in girls as early as 8, but typical cases may be met with in boys under 10. The condition is not unknown in healthy adult men, and many cases have occurred in the great European War from the terrific shock of modern gun-fire. Anæmia, general weakness, neurasthenia, and local inflammatory conditions of the larynx conduce to it. A reflex stimulus, when it acts on an hysterical type, may originate an attack. It is then attributed to sudden emotion, fright, mental or physical shock, menstruation, pregnancy, uterine disease, disorders of digestion, or intestinal worms. It has been attributed to cold or the inhalation of certain odours. When a person is "struck dumb" with fright, anger, joy, or grief, the condition is one of aggravated functional aphonia, combined with

paralysis of the whole speech mechanism. In "hysterical mutism," as this is called, the patient cannot even whisper.

Myopathic paresis occurs with any catarrhal affection of the larynx, is frequently due to misuse or over-use of the voice, and may be induced by such toxic causes as (a) tubercle, (b) syphilis (Diday), (c) typhoid, (d) typhus, (e) cholera, and (f) phosphorus, copper, arsenic, or lead.

Symptoms.—In hysterical cases the onset is generally sudden, and the recovery as abrupt. The patient reports that the voice went "all at once," or that she woke one morning, generally after some mental shock or strain the previous day, and found she could only whisper. There is often a history of previous sudden disappearances and recoveries. In cases due to general or local weakness the onset is more gradual and the recovery is apt to be very tedious. The voice is weak and toneless, and much exertion is required for the patient to make herself audible at any distance. The cords are seen to be incompletely adducted on phonation, and there is generally associated paresis of the internal tensors and, possibly, of the interarytenoideus. In the hysterical form, speech is reduced to a whisper. If encouraged to speak loudly the patient, with apparently great exertion and goodwill, emits only a more penetrating whisper, together with considerable phonative waste. There will be no complaint of dysphagia, no cough, and, although there may be decided anæmia, there is no marked loss of weight, no rise of temperature, no physical signs in the lungs. When the patient coughs it is not harsh, but the cough is usually loud.

Examination of these cases shows the cords in the ordinary position of respiration (Fig. 245, p. 538). On deep inspiration they gape still more, but when the patient is asked to say *E*, she may shake her head hopelessly, while the cords remain immobile or only make a limited movement towards the middle line. If then told not to trouble about *E*, but just to give a little cough, the cords will be seen promptly to come in contact, and the opinion that the paresis is functional is fully established. If the patient cannot be induced to cough, a successful effort at making her laugh will show the mobility of the cords.

There are other cases in which, when the patient is instructed to vocalize, the cords are seen to come together quite perfectly, but at the very moment that phonation should take place they gape widely apart in abduction with a noisy expiration. This spasmodic but toneless adduction of the cords is sometimes accompanied by convulsive movements of the face.*

Diagnosis.—When the complete adduction of the cords has

* M. Mignon, *Soc. Franç. de Laryngol.*, Mai, 1902.

been observed, in coughing, laughing, or attempted phonation, there is no doubt as to the diagnosis. But it is important to remember that functional adductor paralysis, without any perceptible change in the larynx beyond anæmia, not infrequently occurs in incipient tuberculosis.

Organic paralysis of the adductors may occur in the later stage of recurrent paralysis. In that case it is preceded by palsy of the abductor muscle, and may be unilateral, or bilateral, or complete. Otherwise adductor paralysis is always (*a*) myopathic or (*b*) functional; it then is rarely complete, and in the functional form is never unilateral.

Prognosis.—Generally speaking, complete aphonia coming on suddenly will disappear or can be cured suddenly. Whereas an incomplete aphonia coming on slowly is slow in getting well.

Treatment.—The cure of functional aphonia is best effected by suggestive treatment. The patient should be kindly but authoritatively told that her disease is quite curable, and that her voice will soon be restored, as its loss only depends on weakness of the vocal cords. With the laryngeal mirror in position she should be asked to take a few deep breaths, then to fill the chest well and make some loud expiratory noises, and then to cough repeatedly. During a little pause, she should be informed that it is seen that her voice is rapidly returning. The mirror is then reintroduced, and the procedures repeated, terminating, if possible, with the emission of the vowel *E*. As soon as this is effected, the mirror is removed, and the patient firmly requested to count aloud up to ten.

If this scheme, even on renewal, fails, I have frequently obtained success by using a little chloride of ethyl to spray the front of the neck and each side of the larynx before repeating the manœuvres—the effect is doubtless entirely due to suggestion. Another method, which, of course, acts in the same way, is to give a sudden, sharp, and unexpected pressure with the thumb and forefinger of the right hand on the two greater cornua of the hyoid bone, while asking the patient suddenly what she feels and firmly requesting her to count in a loud voice.*

If the case is still obdurate, the next step is to state that now it is necessary to make an application to the vocal cords. A laryngeal brush is dipped in some astringent, such as perchloride of iron, nitrate of silver, or chloride of zinc, and the larynx swabbed out. The patient is encouraged to phonate during the subsequent spasm. This treatment should be repeated once or twice a week, but a

* Citelli, *Proc. XVIIth Internat. Cong. Med.*, London, 1913, Section xv., Part ii., p. 427.

certain dread of it will prevent a relapse. Even if not successful on the first occasion, it should be persevered with at subsequent sittings, since, combined with general measures and the acquisition of the patient's confidence, it will as a rule finally prove successful.

Should the paralysis persist after a thorough trial of the above measures, recourse must be had to faradism. One electrode is placed over the episternal notch, while the other is applied alternately to the sides of the larynx. It is well to start at once with a fairly strong current, as the sudden mental shock appears to have more effect than when the patient is first habituated to a feeble current.

Finally, in some very resistant cases of hysteria, one pole of the battery must be connected with an intralaryngeal electrode which is guided into the larynx by the laryngoscopic mirror. As soon as it reaches the glottis, the circuit is completed, the patient utters a sharp cry, and on withdrawing the electrode the voice is restored.

Throughout the manœuvres the physician should show no trace of discouragement, and if he fails with one device he should try to convey the impression that it was but a step forwards towards the completion of the cure. His manner should be confident, inspiring, and very firm, but as kind as possible, and free from any harshness. He should persevere calmly but strenuously, as much more difficulty is likely to be encountered in cases where the restoration of the voice has to be deferred to a second sitting. A sudden flow of tears will often herald the onset of recovery. This should encourage the practitioner to persevere, but with added sympathy and encouragement. With tact and determination the suggestive treatment indicated will prove successful. It is well to avoid recourse to electricity. Relapse may occur after it, and patients cherish such a lively recollection of its discomfort that they may point-blank refuse to submit to it a second time.

The patient should be encouraged to make free use of the restored voice by talking, singing, or reading aloud, and any threatened relapse to whispering should be immediately checked. The general health and hygienic habits require attention. Active outdoor occupation and amusement are to be recommended. Iron, nux vomica, strychnine, and other tonics may be indicated, and local treatment should, if possible, be avoided.

iii. *Paralysis of the Arytenoideus Muscle*

This muscle is seldom completely paralysed. It may be rendered paretic in many catarrhal conditions, and often shares in the functional paralysis of hysteria (Fig. 248, B, p. 539).

The **symptoms** are those of the accompanying laryngitis (pp. 479 and 488), or resemble paralysis of the other adductor muscles.

Laryngoscopic **examination** shows on phonation a triangular chink between the vocal processes, the cords being brought together by the crico-arytenoidei externi and rendered tense by the thyro-arytenoidei, while the arytenoideus muscle fails to approximate their posterior extremities (Fig. 254, and cf. Fig. 248, B, p. 539). Sometimes the thyro-arytenoidei muscles are affected at the same time (Fig. 255), and then the glottis, on phonation, assumes the form of a characteristic double chink.

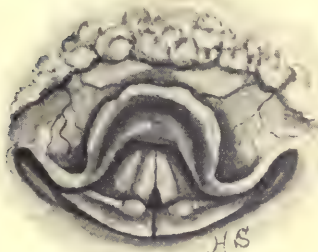


Fig. 254. — Paralysis of the interarytenoideus muscle.



Fig. 255.—Paralysis of the internal tensors of the vocal cords.

It is seen that the epiglottis is tilted forwards, the arytenoids are approximated (by the interarytenoid muscle) and the cords approximated (by the crico-arytenoidei laterales), but that the cords remain concave and apart owing to failure of the internal tensor muscles.

Treatment is conducted on similar lines to that already described for the other adductor muscles, but chiefly forms part of that of the accompanying laryngitis.

iv. *Paralysis of the Thyro-Arytenoidei Interni and Externi*

Synonym.—*Paralysis of the internal tensors of the vocal cords.*

Etiology.—When occurring primarily, or when unaccompanied by paralysis of the abductors, this form of laryngeal paralysis is usually functional, and is due to catarrhal or other form of laryngitis, overstraining or misuse of the voice, anæmia, or general debility. It may be myopathic in cases of singer's nodules (p. 494), or secondary to the impaired action entailed by neoplasms. It may be also an early symptom of tuberculosis (Plate xv., Fig. 5, facing p. 468).

But paralysis of the internal tensors may follow and co-exist with abductor paralysis, forming part of the symptom-

complex of paralysis of the recurrent nerve. It may then be due to any of the numerous causes of the latter (*see* p. 556).

Symptoms.—Although the crico-arytenoidei laterales muscles bring the cords into contact in the middle line (Fig. 248, A, p. 539), they effect no tension in them, and the cords would be blown apart on attempted phonation were it not for the muscles under consideration. The vocal cords are practically the tendons of the thyro-arytenoidei interni, the muscle fibres lying below them and being inserted into the anterior two-thirds. Their function is to render tense the free margin of the cords, and prevent them from being over-blown in expiration. When they are paralysed the cords lose their flat appearance, becoming rounded on the surface and excavated at their free margin. In phonation, when the cords have been brought together by the crico-arytenoidei laterales, the thyro-arytenoidei interni fail to maintain their tension and an elliptical space is left (Fig. 255). The symptoms of this are phonative waste, a weak, toneless voice, and fatigue on talking.

The symptoms, when due to an organic lesion, are described elsewhere.

The thyro-arytenoidei externi embrace the sacculus laryngis and are inserted into the outer border of the processus muscularis of the corresponding arytenoid cartilage. They therefore assist in the adduction of the vocal cords.

Treatment.—This often entails attention to the patient's entire upper air-tract, as well as to his general health and habits. The section on the treatment of chronic laryngitis should be consulted (p. 488). In many cases the condition is very tedious, and the difficulty in correcting it is often enhanced by the patient's faulty method of singing or public speaking. Proper voice exercises are very valuable, and the local faradic current may be necessary.

It is well to remember that in some patients, with quite normal speaking voices, there is always an elliptical chink left between the cords when they are approximated in phonation.

B. Paralysis of the Abductors of the Vocal Cords

This, the most usual form of organic palsy met with in the larynx, is generally referred to as "abductor paralysis" by English writers, and "Posticuslähmung" by German writers.

The crico-arytenoideus posticus muscle, for convenience referred to as the posticus muscle, is described at p. 539. It is the one and only abductor muscle of the vocal cord, being in constant use during respiration and in strong action during deep inspiration. Its action is illustrated in Fig. 248, c (p. 539).

Etiology.—Paralysis of the posticus muscle may arise from—

(a) Cortical lesions (doubtful).

(b) Bulbar lesions (not infrequent).

(c) Lesions of the motor tract in the vagus or recurrent laryngeal nerve (the most common).

(d) Peripheral neuritis.

(e) Myopathic inflammation.

Finally, mechanical fixation of the crico-arytenoideus posticus must be kept in mind, as its phenomena, especially in unilateral lesions, closely resemble true paralysis.

These points will now be examined in order :—

(a) **Cortical lesions.**—Nothing positive is known of any cortical cause of posticus paralysis. It has already been pointed out that it would require a bilateral and identical lesion involving the two cortical centres, or the motor fibres passing from them to the medulla, in order to produce this result. Such a pathological occurrence is never likely to arise, and not a single case has been described (cf. p. 541).

(b) **Bulbar lesions.**—These paralyses, particularly of the vagus nucleus, are practically the only central paralyses met with. The posticus or abductor muscle may be affected in the following bulbar conditions :—

Vascular lesions such as thrombosis, hæmorrhage, and embolism. Syphilitic gummata. Tumours, aneurysm, and abscess, compressing the bulb. Diphtheria. General paralysis. Glosso-labio-laryngeal paralysis. Locomotor ataxia (in bulbar form). Disseminated cerebro-spinal sclerosis. Amyotrophic lateral sclerosis. Syringomyelia of the bulb (i.e. syringo-bulbia).

(c) **Lesions of motor fibres in the vagus trunk or recurrent laryngeal.**—These include—

Pressure and direct traumatic or operative injury of the vagus or its recurrent branch (e.g. in ligature of vessels).

Intracranial growths at the base of the brain.

Growths in the neck involving the vagus close to its exit from the skull.

Aneurysm of the internal carotid.

Cervical phlegmon.

Goitre.

Pericarditis (for left recurrent nerve).

Pleural thickening at the apex of the lung (more for right nerve).

Aneurysm of the arch of the aorta (especially for the left nerve); of the innominate artery (for the right); of the left subclavian or carotid arteries.

A dilated left auricle may produce unilateral paralysis by pressure on the left recurrent laryngeal nerve. The nerve is flattened against the aorta either by the dilated left auricle or by the pulmonary artery which is forced upwards by cardiac enlargement. Some 37 cases of this rare complication of mitral disease have been published since the first one described by Ortnier in 1897, but the instances are few in which the causal relationship has been established post mortem.* Some authorities consider it an anatomical impossibility.†

On the left side, chronic broncho-pneumonia, due to irritating dust (Bäumler).

Large pleural effusions.

Cancer of pleura with effusion.

Enlarged bronchial glands.

Diseases of mediastinal tissues and glands (carcinoma, sarcoma, lympho-sarcoma, syphilis, tuberculosis, echinococcus).

Cancer of the œsophagus.

Of all these causes aneurysm of the aortic arch is the most common, and this almost exclusively affects the left recurrent. It is infrequent in women.‡

(d) **Peripheral neuritis of toxic origin** may be due to—

Mineral or vegetable poisons.

The toxins of acute and other infections.

In the first group are included lead, arsenic, iodide of potassium, iodoform; more rarely, antimony, copper, cyanide of potassium, and phosphorus. Among the vegetable poisons are alcohol,§ opium, morphia, atropine, belladonna, cannabis indica, and cocaine. With the exception of lead, the other causes have been suggested on insufficient evidence.||

The toxins of infective diseases may be derived from enteric, acute rheumatic fever, influenza, diphtheria, typhus, pneumonia, puerperal fever, erysipelas, scarlatina, measles, or gonorrhœa.¶

* N. M. Ortnier, *Wien. klin. Woch.*, 1897, No. 33.

F. Massei, *Estratto dal Risveglio Medico d'Abruzzo e Molise*, II., Nos. 33, 34, and 35.

Gavello, *Boll. delle Mal. dell' Orecchio*, Nov., 1905, No. 11.

E. Bonardi, *Gazz. Med. Ital.*, Feb. 1, 1906. (Epitome in *Brit. Med. Journ.*, June 16, 1906.)

H. Frischauer, *Wien. klin. Woch.*, Dec. 28, 1905. (Epitome in *Brit. Med. Journ.*, June 2, 1906.)

J. Garel, *Ann. des Mal. de l'Oreille*, Oct., 1910, p. 315. (A full study with bibliography.)

† G. Killian, *ibid.*, xxxix., 1913, No. 11, p. 485.

‡ F. De Havilland-Hall and W. Permewan, *Roy. Soc. Med. Proc.*, Laryngol. Section, vi., May 2, 1913, p. 139.

§ Percy Kidd, *Brit. Med. Journ.*, May 19, 1888, p. 1060.

|| P. Heymann, *Arch. Internat. de Laryngol.*, ix., 1896, No. 6, p. 585.

¶ S. Perrotta, *Arch. Ital. di Laringol.*, April, 1909, p. 71.

(e) **Inflammatory infiltration of the abductor muscles** is most likely to occur in malignant growths involving the pharyngeal surface of the larynx; but it also results from tuberculosis, syphilis, or injury from foreign bodies.

Laryngeal palsy is much more common in males than in females. It is commoner on the left side, on account of the longer course of the left recurrent laryngeal nerve. It is more rarely bilateral. Thus, in 150 cases, Avellis found paralysis on the left side in 92, on the right side in 46, and only in 12 was it bilateral.

Symptoms.—The most common are weakness or alteration in the tone of the voice, and dyspnoea. The occurrence of dyspnoea will depend on whether the paralysis is unilateral or bilateral. These points will be discussed when considering the objective symptoms. Not infrequently the patient makes no complaint of any symptom referable to the larynx, and a laryngeal palsy is discovered only by accident.

Examination.—In abductor paralysis the appearances will vary as the paralysis is (1) unilateral, or (2) bilateral, and as it (a) is limited to the abductor muscle, or (b) has extended to the other muscles supplied by the recurrent laryngeal nerve.

(1a) Unilateral paralysis limited to the abductor muscle precedes total laryngo-hemiplegia, and this first stage may escape observation. None of the other muscles supplied by the recurrent is affected at the stage in which the abductor fibres succumb first owing to their greater vulnerability. Later on, the unopposed action of the adductor muscles (crico-arytenoideus lateralis, *see* p. 538) and the onset of paralytic contracture maintain the cord in the middle line even on deep inspiration, while the tensor muscle (thyro-arytenoideus internus, *see* p. 539) keeps the cord taut. This explains why, with the other cord working freely, the voice may be unimpaired; and, as there is generally no dyspnoea except possibly on exertion, the condition is frequently overlooked.

If there is dyspnoea with unilateral abductor paralysis, some other cause for it should be sought below the larynx itself, e.g. an aortic aneurysm, a mediastinal growth, or an œsophageal neoplasm invading the trachea.

In a rapidly destructive lesion of the recurrent nerve or its bulbar centre, there may be none of this first stage of paralysis limited to the abductor (posticus) muscle. Complete laryngo-hemiplegia may then occur at once.

(1b) In advanced abductor paralysis (laryngo-hemiplegia or complete recurrent paralysis), when not of myopathic origin, the other muscles supplied by the recurrent laryngeal nerve are also

involved. The adductor then becomes paralysed and ceases to draw the cord towards the middle line, and when, in addition, the tensor muscle fails, the cord becomes relaxed, its margin looks excavated, and, owing to atrophy, the upper surface appears narrowed.

During quiet respiration the condition might escape notice, but on deep inspiration the sound cord will be seen to abduct widely from the middle line, and pass farther back, while the affected one remains passive in the cadaveric position midway between respiration and phonation (Fig. 256). It is only on

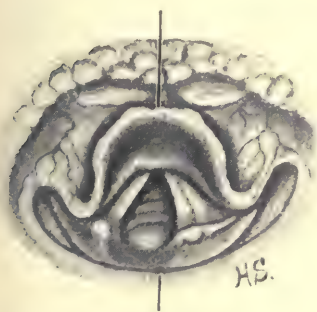


Fig. 256.—Paralysis of left vocal cord, as seen during deep respiration.

The vertical lines in this figure and the next indicate the middle line of the larynx.



Fig. 257. — Paralysis of left vocal cord, as it appears during phonation.

The paralysed cord remains fixed, while the active one crosses the middle line in its effort to close the glottis. It is seen that a chink remains open between the cords (causing the voice of phonative waste), and that the sound arytenoid passes in front of the other on the paralysed side.

phonation that the paralytic condition is distinctly manifested. Then the sound cord not only approaches the middle line but may cross it, in an effort of compensation to close the glottic space. The affected side takes no share in this effort; the arytenoid cartilage either remains immobile or is pushed aside by the vigorous contraction of the opposite side; the cord is stationary in the cadaveric position, and as its free edge remains concave the voice is feeble and somewhat rough, altered in tone and pitch, and with an uncontrollable tendency to "crack." There is so-called air-waste, which can be felt by the hand held over the mouth as the air escapes through the incompletely closed glottis. A failure to detect vibration on the thyroid cartilage is not without significance. The paralysed arytenoid cartilage, as it limply overhangs the cord, may appear somewhat larger than the sound one; and, like

the affected cord, it lies on a somewhat lower level than on the sound side (Fig. 257).

After a complete recurrent paralysis has been established some time the arytenoid cartilage tends to become more or less fixed in the cadaveric position. Partly on account of this, and partly on account of increased compensatory action of the sound cord, the voice may later on recover such strength and clearness as to allow the patient to sing with success. Not infrequently the arytenoid on the paralysed side is seen to twitch slightly inward and forward. This is due to some contraction of the interarytenoid muscle, which retains its efficiency, as it is innervated from both sides, or because it is often supplied by the superior laryngeal nerve instead of the recurrent (Grünwald).^{*} This twitching, when present, is a certain sign that the lesion is nervous and not articular (cf. p. 578).

(2a) Bilateral abductor paralysis is, fortunately, not so common as the unilateral affection. When complete, both cords are kept nearly in the middle line by the unopposed contraction of the adductors. The abductor paralysis is generally not complete at first, and so, on deep inspiration, there may be a slight separation of the cords, while on phonation the cords are completely adducted. Consequently the voice remains good, but the respiration is apt to be embarrassed on exertion.

(2b) When there is complete recurrent paralysis the deepest inspiration fails to widen the glottis. Indeed, on inspiration, instead of separating, the two cords are seen to approach one another, and this becomes more marked the greater the effort made. One explanation of this is that the flaccid cords are sucked together like a valve by the indrawn current of air and by the rarefaction of air below the stenosis. Another is that it is not a passive but an active movement produced by the still slightly active adductors which are accustomed to contract antagonistically to the dilators during inspiration. In support of this latter view some observers have noted that the arytenoids can be seen coming in contact, and that the movement is visible in patients even after tracheotomy, when the larynx no longer serves for the passage of air.

In complete laryngoplegia both cords are fixed in the cadaveric position, respiration may be somewhat less impeded, but the voice is extinguished and the whisper absolutely toneless. But complete laryngoplegia is extremely rare.[†]

As with other conditions of laryngeal stenosis, the degree of

^{*} "Atlas and Abstract of the Diseases of the Larynx," p. 90. London, 1898.

[†] F. Semon, *Proc. Laryngol. Soc., London*, vii., Jan., 1900, p. 42.



Radiogram from a Lance-Corporal who was wounded in the battle of Loos on September 24th, 1915. While he was charging with his head bent forward a bullet entered the left frontal sinus, traversed the orbit, then the left maxillary sinus, and came to rest at the base of the skull. The eye was shattered and had to be removed. The perforation through the frontal sinus healed slowly. Three months later the left maxillary sinus was still dark to transillumination but contained no pus. The tongue was protruded to the left side, the palate on phonation was drawn up to the right side, and the left vocal cord was completely fixed. The bullet which caused this paralysis is well shown in the plate. It was lodged so deeply under the base of the skull that it could not be located by touch. As it caused no further symptoms it has been left alone.

dyspnœa in double recurrent paralysis will depend to a large extent on the slowness or rapidity with which it develops (pp. 574 and 586). With slow onset the patient may make no complaint of dyspnœa, although examination will reveal a chink so small that it seems hardly sufficient for respiration. On the other hand, cases of rapid onset may feel an amount of dyspnœa, which diminishes as the condition becomes established.

All sufferers from double abductor paralysis are liable to attacks of urgent dyspnœa and inspiratory stridor, not only on slight exertion or mental excitement, but also during sleep, on entering a very vitiated atmosphere, and with the onset of any catarrh.

Massei has detected a partial or complete anæsthesia of the larynx in recurrent paralysis, never limited to the paralysed side, more marked when the right nerve is affected, and not noticed if the nerve is completely divided.* These observations have not been generally confirmed.†

To summarize alongside of one another the symptoms of laryngeal paralysis, and the state of the lesion of the recurrent laryngeal nerve, we can tabulate them as follows :—

Spasmodic adduction of the vocal cords,	=	Transitory pressure on the recurrent nerve.
Paralysis limited to the abductor (posticus) muscle,	=	Early but constant pressure on the recurrent nerve.
Spastic laryngeal contraction,	=	Pressure of some standing on the recurrent nerve.
Complete paralysis of a vocal cord,	=	Advanced degree of pressure on the recurrent nerve.

Prognosis.—The outlook in double abductor paralysis is always grave, as any aggravation may end in fatal asphyxia. It is still more so if the condition is due to a large goitre, whose presence may prevent the performance of a prompt tracheotomy.

When only one side is affected the patient is not in the same constantly threatened state, as there is no risk of death being directly due to the paralysis. But the paralysis of the cord aggravates any catarrhal process, and interferes with speaking, singing, and coughing. In an early stage of aneurysm the recurrent paralysis may be intermittent. It is well to remember that, in addition to the paralysis of the cord produced by aneurysm, goitre, or œsophageal cancer, there may also be stenosis lower down, brought about by direct compression of the trachea or bronchi from the same cause.

* *Estratto dal Risveglio Medico d'Abruzzo e Molise*, ii., 1907, Nos. 33, 34, 35.
La Pratica Oto-rino-laringoiatrica, Ottobre, 1907.

† Emil Glas, *Wien. med. Woch.*, lviii., 1903, S. 911.

As regards recovery, the prognosis is, generally, unfavourable, as most of the causal conditions are incurable. Partial paralysis of influenzal or other toxic origin, or due to some removable cause like goitre or syphilis, may disappear. But if the paralysis is complete it is generally permanent, and irreparable atrophy of nerves and muscles results. Post-operative paralysis of the recurrent laryngeal nerve, after operation on a thyroid tumour, is not necessarily caused by direct traumatic injury of the nerve by the surgeon's knife. It does not always set in immediately after operation; it may be due to cicatricial contraction, and it is not inevitably permanent.*

Diagnosis.—This is generally established by inspection and observance of the points indicated.

It is important not to mistake for paralysis the appearance of a cord which is mechanically impeded in its movements. Thus, a cord may be prevented from acting by a growth in the inter-arytenoid space or in the ary-epiglottic fold (Plate xv., Fig. 4, facing p. 468); or its movements may be sluggish owing to infiltration in its own layers (Plate xv., Fig. 3, and Plate xviii., Figs. 5 and 6, facing p. 520), or in the soft tissues adjoining (Fig. 285, p. 688). In the early stages of these latter conditions it will be noticed that the movements are impaired in both adduction and abduction; and, by the time the cord is more fixed, the local cause is generally quite evident.

More difficulty is encountered in distinguishing ankylosis of the crico-arytenoid joint from complete recurrent hemiplegia, but diagnosis is generally possible by attention to the following points:—

DIAGNOSIS OF PARALYSIS OF THE RECURRENT LARYNGEAL NERVE AND ANKYLOSIS OF THE CRICO-ARYTENOID ARTICULATION

Paralysis

No swelling.

The arytenoid cartilage on paralysed side is, during phonation, pushed aside by the sound and over-adducted healthy cord. (As a paralysed cord in time gets fixed, from disuse, this diagnostic point has a greater positive than negative value.)

Ankylosis

May have some obvious swelling around crico-arytenoid joint.

The active arytenoid cartilage approaches, but does not displace, that on the affected side.

Any excursion of movement is incomplete.

* E. Felix, *Arch. Internat. de Laryngol.*, xxiv., 1907, No. 6.

Paralysis

The cord is fixed in the middle line or in the cadaveric position.

If the interarytenoid muscle retains any power, and twitches the arytenoid cartilage on the paralysed side slightly inward and forward, it shows the passive mobility of the articulation, and is a reliable means of excluding joint disease (Grünwald).

If the position of the cord is at first median and then cadaveric it is due to a nerve lesion.

Presence of central or peripheral lesion which can produce paralysis.

By pressing against the arytenoid cartilage with a laryngeal probe, in recent paralysis, absence of fixation can be proved. In paralysis of long standing this test is invalidated by reason of tendency in such cases to gradual fixation of joint from disuse.

A cord may be fixed by a combination of mechanical and paralytic causes—as when there is tubercular infiltration round a joint and at the same time pressure on the recurrent laryngeal nerve by tubercular glands or pleural adhesions.

Treatment.—This must be decided by the primary cause. Local applications of electricity, external and internal, are often recommended, but I have found them distressing and of little help. Whenever there is a suspicion of syphilis, specific treatment should be vigorously administered. If due to a goitre the bilateral paralysis may be cured by removal of the thyroid isthmus.* The hoarseness or weakness of the voice in unilateral paralysis can be improved by methodical vocal exercises.†

The attacks of dyspnoea in locomotor ataxy may be relieved by inhaling nitrite of amyl (Watson Williams), or by the administration of antipyrin or bromide of potassium.

As a complete bilateral laryngeal paralysis may suddenly,

Ankylosis

If the cord is quite immobile, its fixation may not correspond in position with any recognized form of laryngeal palsy.

Jerky movements of the cord.

Absence of symptoms of a nervous origin. No progressive development of the appearances. History of local inflammatory conditions.

No change of position possible by manipulation with a laryngeal probe (Delavan).

* Morell Mackenzie, "Diseases of the Throat and Nose," i., 1880, p. 444.

Samuel Lodge, jun., *Lancet*, Feb. 4, 1899.

H. J. Davis, *Proc. Roy. Soc. of Med.*, Laryngol. Section, June, 1909, p. 165.

† G. Spiess, *Arch. f. Laryngol.*, Bd. xvi., Heft 3.

at any moment, be complicated by severe fatal asphyxia, the patient should be advised to have a tracheotomy performed or wear an intubation tube. The latter renders the patient quite voiceless, and is therefore only suitable in a few cases where recovery from the cause of paralysis is impossible. In all other cases tracheotomy is the only satisfactory procedure.* The patient may be able to breathe all day with the tube plugged, and thus he suffers no inconvenience in speaking, straining at stool, etc. At night, and when there is laryngeal irritation or any need for larger breathing, the plug is readily removed.

It has been proposed to excise one or both of the cords to relieve the stenosed air-way. The idea has only been put into practice in the case of "roaring" horses, but in them it has proved quite useless. This condition of "roaring" can be relieved by "ventricle-stripping"—an operation which is not suitable for human patients, as it entails complete loss of voice.†

DIFFERENTIAL DIAGNOSIS OF THE CAUSES OF LARYNGEAL PARALYSIS

Laryngeal paralysis as a symptom not only affords information as regards local conditions, but it is also an aid to the diagnosis, prognosis, and treatment of diverse processes. In many of these it may be the one conclusive point of evidence; in others it may for some time be the only objective indication of various possibilities.

It should first be determined that there is real paralysis and not a mechanical interference with the mobility of the vocal cord (p. 562).

The laryngoscopic condition most frequently seen in paralysis is one of the following:—

1. The cords abduct normally, but fail to meet on phonation (= bilateral paralysis of the adductors).

2. The cords adduct completely, but, on deep inspiration, one cord fails to abduct beyond the cadaveric position (= unilateral abductor paralysis) (Fig. 256, p. 559).

3. One cord is immobile in the cadaveric position (= unilateral recurrent paralysis) (Fig. 257, p. 559).

4. Immobility of both cords in a more or less adducted position (= bilateral abductor paralysis).

1. *Bilateral paralysis of the adductors* is, as we have seen, generally hysteric (p. 550). It might possibly be diphtheritic, and in

* F. Semon, *Trans. Clin. Soc., London*, xii., 1879, p. 184.

† F. Hobday, *Proc. Roy. Soc. Med., Laryngol. Sec.*, iv., No. 6, April, 1911, p. 87. Citelli, *Journ. of Laryngol.*, xxx., 1915, No. 4, p. 174.

that case the history, and any associated paralysis of the soft palate, would assist the diagnosis.

2. *Unilateral abductor paralysis* is, in the large majority of cases, the consequence of pressure on one recurrent laryngeal nerve or the vagus trunk (*see* list of causes at p. 556). This pressure should first be carefully sought for in the neck in the form of goitre, enlarged glands, or malignant disease of the œsophagus. If the examination of the neck is negative, the cause may be found in the chest. Tumours of the mediastinum and aneurysm of the aorta are very apt to be latent, and if a bulbar as well as a cervical lesion can be eliminated, the possibility of pressure in the chest must be maintained, particularly in left-sided lesions. In many such cases the diagnosis is assisted by a Röntgen-ray photograph and the administration of iodide of potassium.

When no cause of compression in the neck or chest is discoverable we must think of peripheral neuritis.

The following points are worth recalling :—

(a) Peripheral paralysis is more frequent than that of central origin.

(b) The left cord is much more often paralysed than the right.

(c) Aneurysm of the arch of the aorta is the most frequent cause.

(d) Abductor paralysis is more common in men than in women.

If the crico-thyroid muscle is paralysed, as well as all those supplied by the recurrent, it would indicate a lesion of the vagus trunk above the origin of the superior laryngeal branch. In such a case there would be diminution of sensation in the corresponding half of the larynx.

When the soft palate on the same side is paralysed as well as the vocal cord (syndroma of Avellis) the lesion is generally peripheral, in the extracranial course of the nerve fibres. If the muscles of the shoulder (sterno-mastoid and trapezius) or of the tongue, on the same side, are also palsied (syndroma of Hughlings-Jackson), it indicates a lesion still nearer the point of exit from the cranium. When an abductor paralysis is associated with various or complicated nerve symptoms (as in bulbar paralysis, disseminated sclerosis, lateral amyotrophic sclerosis, tabes, syringomyelia, progressive muscular atrophy, or syphilis), the seat of the lesion is often, though not always, central and generally bulbar. Atypical and crossed forms are also met with.*

* C. Poli, *Arch. Ital. di Laring.*, xxvi., Aprile, 1906, fasc. 2.
Félix Rose and F. Lemaitre, "De l'Hémiplégie Palato-Laryngée," *Ann. des Mal. de l'Oreille*, xxxiii., 1907, 2. No. II, p. 467.
A. G. Tapia, *Presse Oto-Laryngol. Belge*, Fév., 1905, No. 2.
A. G. Tapia, *Arch. Internat. de Laryngol.*, xxii., 1906, p. 780.
E. F. Sanz, *ibid.*, xxxi., 1911, p. 469.

3. *Complete unilateral recurrent paralysis* is not nearly so frequently met with as unilateral abductor paralysis. It is generally a further stage of this latter condition, and is due to the same causes. It has been traced to alcoholism.*

4. *Bilateral abductor paralysis*.—In this rare condition the choice of diagnosis lies between (a) bilateral pressure on the recurrent nerves, and (b) a bulbar lesion, which in 99 per cent. of cases is due to locomotor ataxy (Luc). This latter is the more likely if careful examination of the chest and neck is negative.

A central nerve lesion, in bilateral abductor paralysis, is also more probable if (1) the pulse is increased in frequency without any fever or cause in the chest (= implication of the cardiac inhibitory centre), and if (2) there is involvement of other cerebral nerves—ocular, palatal, lingual, or pharyngeal.

Paralysis may be more marked on one side than on the other, e.g. one cord may be quite fixed in the cadaveric position, while the other only fails to abduct normally, although, on phonation, its power of adduction is still retained. This shows that the destructive lesion involving the recurrences, the vagus, or the bulbar centres, is more advanced on one side than on the other.

Finally, in double abductor paralysis, it is only after carefully excluding central or trunk affections that the various possible causes of peripheral neuritis need be sought for.

Often the cause of recurrent paralysis cannot be positively ascertained in life. In 150 cases examined by Avellis it could only be determined in 85.

In addition to the above four types of laryngeal palsy, we may note that paralysis of the crico-thyroid muscle, especially occurring alone, is extremely rare (p. 547).

Paralysis of the interarytenoideus or of the internal thyroarytenoideus may occur alone. It may be difficult to determine the cause. It may result from exaggerated vocal efforts, laryngitis, neurasthenia, or hysteria, and may precede the onset of tuberculosis. It may also be due to diphtheria.

* Dundas Grant, *Journ. of Laryngol.*, xii., 1897, No. 10, p. 540.

CHAPTER XXXIX

NEUROSES OF THE LARYNX (Concluded)

C. NEUROSES OF INCO-ORDINATION OR PARAKINETIC NEUROSES

Choreic movements in the vocal cords may sometimes be seen in disseminated sclerosis, and are also said to be associated with general chorea.

Phonic spasm, or **dysphonia spastica**, is a rare affection, which has been compared with writer's cramp. It occurs in professional voice-users of nervous temperament, who, on attempted phonation, are seized with a spasmodic contraction of the adductors and tensors of the vocal cords. The spasm may cease when the attempt at phonation is abandoned. B. Fraenkel gave the name of *mogiphonia* to that form of spasm which only occurs on attempts at singing or public speaking, but does not interfere with ordinary conversation.

Treatment is apt to be disappointing. Strict rest of the voice is the first necessity, to be followed by breathing and speaking exercises, tonics, and treatment on the lines indicated in the sections on Chronic Laryngitis (p. 488) and Singer's Nodules (p. 494).

NERVOUS LARYNGEAL COUGH AND CRY

This is emitted on an expiratory spasmodic contraction of the adductors, repeated at varying but sometimes regular intervals during the day, and generally ceasing at night. It stops when the patient's attention is diverted, as during laryngoscopic examination, or when social controlling influences are more marked, as in a church or theatre. It consists of a slight, short, sharp, grating, unmusical, explosive cough, and, as it is commonly met with in both males and females about the age of 14 to 20, it has been called "the barking cough of puberty" (Andrew Clark). There are no local or general symptoms, no expectoration, and no change in the voice. The cough may go on for months and years without apparently affecting the patient's health or comfort.

A spasmodic laryngeal cry may take the place of the cough, otherwise the conditions are the same. In one case a boy of 11 emitted a sudden explosive cry, not resembling any vowel or word, but not unlike a milkman's cry. It recurred at irregular intervals of 12 seconds to 1½ minutes, and was said to persist in sleep. With one interval of 3 minutes this cry had gone on for 18 months.*

Diagnosis.—This “tic convulsif” is distinguished from other coughs by its solitary explosion, sudden onset, absence of expectoration, and preservation of voice. There is neither the preliminary deep inspiration, nor the subsequent shortness of breath, which occurs in the cycle of a true spasmodic cough.

Treatment.—Some cases of nervous cough may be traced to nasal or pharyngeal irritation. If adenoids or tonsils are present, they should be removed; but a cure should not be promised, as the cough may persist and require treatment by attention to general health, hygiene, air, baths, and exercise. Breathing exercises are often beneficial. Iron, arsenic, strychnine, maltine, or cod-liver oil are more useful than chloral and the bromides, which should only be given to quiet marked irritation. Hypnotism, change of air, and sea voyages have been recommended, and faradism and high-frequency currents will often prove beneficial.

LARYNGEAL VERTIGO

Synonyms.—*Laryngeal ictus*; *laryngeal syncope*.

Laryngeal vertigo is neither a distinctly sensory nor a distinctly motor disturbance, but transitional between the two.

When Luc's monograph was written (Dec., 1892), only about twenty authentic cases had been published, so that it is a rare as well as a curious form of spasm of the larynx.

Etiology.—The affection is mostly met with between the ages of 35 and 70. The causes producing the irritation of the larynx are quite unknown. Tobacco and alcohol are frequent predisposing causes; the arterio-sclerotic furnish a number of subjects; and cases are common amongst those whom French authors term the “arthritic.” Cases have been described as a manifestation of pertussis in adults (Avellis). They are sometimes confused with the laryngeal crises of tabes.† The attacks are influenced in frequency by the state of the atmosphere, and by exposure to such irritants as tobacco smoke.

* J. W. Bond, *Proc. Laryngol. Soc., London*, iii., May, 1896, p. 80.

† *Proc. Roy. Soc. Med., Laryngol. Section*, Nov., 1908, p. 16.

Pathology.—The affection is ill-defined, and views vary as to its pathology. Some adhere to Charcot's first conception of it as a vertigo *sui generis*, analogous to Ménière's disease. Some regard it as a form of *petit mal*; and others as due to spasm of the glottis, with arrest of the action of the muscles of respiration. McBride attributes the symptom-complex to forced expiration with a closed glottis.*

Symptoms.—Preceded by tickling and irritation in the larynx, there is a violent coughing fit, and perhaps glottic spasm, in every way comparable to that of whooping-cough. The face becomes congested, and threatenings of asphyxia are felt. Sometimes there is only slight cough, and, instead of cyanosis, the face is pale. In the midst of the coughing attack the patient falls to the ground, unconscious or confused. He soon recovers, as a rule completely, but occasionally with slight mental confusion for awhile. There is no involuntary micturition; occasionally the tongue is bitten; not uncommonly convulsive movements of the face or limbs occur. Hæmorrhages may take place into the vocal cords or the conjunctivæ.† There may be every variety in frequency of attacks, from fifteen in the day to only one in a lifetime.

Prognosis is favourable.

Diagnosis.—The affection must be distinguished from violent laryngeal spasm producing a momentary disturbance of the cerebral circulation, or of vision, with sensations of vertigo and a fall, such as may occur in whooping-cough. The term laryngeal vertigo should be reserved exclusively for cases where unconsciousness appears to be clearly independent of the passive congestion caused by the cough, and is attributable to a reflex of laryngeal origin.

Treatment.—Sources of irritation should be sought and, if possible, removed. The administration of chloral, the bromides, or of antipyrin may prove useful. De Havilland Hall recommends small doses of iodide of potassium and chloride of ammonium, with a linctus containing half a minim of trinitrin. The attack itself is treated with a few whiffs of chloroform, or the vaporole recommended on p. 546, and a gag is inserted between the teeth if there are any convulsive movements.

* *Edin. Med. Journ.*, xxix., 1884, p. 790.

† H. J. Davis, *Proc. Roy. Soc. Med.*, Laryngol. Section, Feb. 4, 1910.

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 J. R. Gasquet, *Practitioner*, Aug., 1878.
 Frederick L. Knight, *Trans. Amer. Laryngol. Assoc.*, 1886.
 Paul Niel, *Ann. des Mal. de l'Oreille*, Août, 1899, No. 8.

LARYNGEAL SYMPTOMS IN INTRATHORACIC ANEURYSM AND CERTAIN CHRONIC DISEASES OF THE NERVOUS SYSTEM

Radiography has taught us that aneurysms are more frequent than was formerly supposed, and the laryngologist is in a favourable position to diagnose an aneurysm of the arch of the aorta. In 35 consecutive cases of intrathoracic aneurysm De Havilland Hall found the laryngeal nerves affected in 22 patients. In 14 cases the left cord was in the cadaveric position and in 5 its abduction only was impaired. In 2 cases there was impaired movement of the right cord, and in 1 there was bilateral abductor paralysis.*

So valuable are the laryngeal manifestations in aneurysm and in certain diseases of the nervous system that it seems well to consider them briefly.†

THE LARYNGEAL SYMPTOMS OF INTRATHORACIC ANEURYSM

The chief are (1) cough, (2) attacks of dyspnoea, and (3) alterations in voice, and are due to irritation or pressure on the pneumogastric nerves or their recurrent laryngeal branches. Bearing in mind the course of these nerves on each side (p. 540), it is obvious that the left recurrent is more exposed to pressure from aortic aneurysm than is the right. Still less frequently is it possible for an aneurysm to cause compression on both sides.‡

The symptoms will vary as the aneurysm presses on (a) a recurrent nerve, i.e. a nerve containing only centrifugal motor fibres; or (b) the vagus nerve itself, i.e. a nerve containing centripetal fibres as well as centrifugal motor fibres.

(a) Irritation of a recurrent laryngeal nerve will produce spasm or paralysis of the corresponding cord, according to the degree and continuance of the pressure. In the first case, probably all the muscles on one side of the larynx are irritated, and there may be occasional and not severe dyspnoea, owing to the freedom of the unaffected cord. In the second case, when the pressure is sufficient to cause paralysis, the first muscle affected is the abductor, as explained by Semon's law on p. 541. This may not be accompanied by any change of voice, or dyspnoea, in quiet respiration (Fig. 256, p. 559). But with progressive and continuous pressure the internal tensors on the same side become paralysed (Fig. 257, p. 559). As already explained, this condition is the cause of fatigue of the voice, which becomes weak, wanting in tone, altered in pitch, rough, and with a tendency to "crack" suddenly into a falsetto; there may also be "phonative

* Lumleian Lectures, *Lancet*, March 22 and 29, and April 5, 1913.

† Moritz Schmidt, *Ann. des Mal. de l'Oreille*, 1899, No. 5, 162.

Collet, *Rev. de Laryngol.*, xx., ii., 1900, No. 33, p. 203.

‡ Deygas, Thèse de Lyon, 1902.

Revol, *Ann. des Mal. de l'Oreille*, xxx., 1904, No. 2, p. 162.

waste." Catarrh, possibly consequent on laryngeal irritation or pressure of the aneurysm on a bronchus, adds to the alterations of voice. There may be no dyspnœa in quiet respiration. The symptoms at first may be intermittent, and even a complete recurrent paralysis may disappear.*

(b) Pressure on a *vagus trunk* produces different results. At first it produces spasm, as when the recurrent is irritated, but the spasm affects both cords, as explained on p. 540. The spasm is manifested by paroxysmal cough, with transient stridor and dyspnœa (*see* Spasm of the Glottis in Adults, p. 545).

With progressive compression of the vagus trunk paralysis of the muscles in the corresponding cord takes place in the usual order (i.e. first abductor, then tensor and adductor), while spasm may still be set up in both cords.† This leads not only to alteration of voice, but to paroxysmal attacks of coughing with inspiratory stridor and dyspnœa. If to this be added abductor paralysis of the opposite cord, the condition is much more serious. The voice is lost. The spasm may still occur, but when it relaxes, neither cord is able to gape sufficiently to allow a compensatory amount of air to pass the narrow glottis, and violent inspiratory efforts only result in sucking the flaccid cords together, so that fatal asphyxia is a very possible consequence.

Other respiratory symptoms may be produced lower down by direct pressure of the aneurysmal sac on the trachea or bronchi.

Amongst other symptoms which may help in deciding that a laryngeal palsy is due to aneurysm are the following:—

The cough in the stage of irritative pressure is paroxysmal, hoarse, imperfect, and brassy. When one or both recurrences are completely paralysed, the cough loses its sharp, ringing character, and becomes hollow and blowing, or, as Wyllie terms it, "bovine," like the cough of a cow, which has no false cords or ventricles of Morgagni.

It is unnecessary to recall the physical signs of aneurysm in the thorax, the condition of the pupils and pulses, etc., as they are fully described in textbooks of medicine. But reference may be made to the value of the following:—

A laryngoplegia often comes on suddenly.

In the mirror the edge of the epiglottis may be seen moving synchronously with the pulse.

With the Killian position (p. 41), when the patient is standing, pulsation may be seen conveyed to the whole length of the trachea.

With the patient's head thrown back and the cricoid held between the thumb and forefinger, tracheal tugging may be detected.

Neuralgic pains in the chest and left shoulder, and anginal attacks, are common.

Dyspnœa and stridor may be marked.

Dysphagia, according to some observers, is a rare symptom.

Percussion and auscultation are of secondary importance compared with the above tests.‡

A radiogram should be taken in all suspected cases.

* Landgraf, *Rev. Hebd. de Laryngol.*, xx., ii., 1900, No. 48, p. 651.

† George Johnson, "The Laryngeal Symptoms which result from the Pressure of Aneurysmal and other Tumours upon the Vagus and Recurrent Nerves," *Med.-Chir. Trans.*, lvi., 1875, p. 29.

‡ Garel, *Ann. des Mal. de l'Oreille*, 1907, No. 2.

LARYNGEAL NEUROSES IN CERTAIN CEREBRO-SPINAL DISEASES

Locomotor ataxy.—When the medulla oblongata is invaded, as it often is, in the course of tabes dorsalis, the vagus nucleus is very frequently attacked. This may give rise to—

1. Disturbances of sensation:—Anæsthesia, paræsthesia, hyperæsthesia of the larynx, often referred to as tickling, irritation, tightness, or a sensation of choking.

2. Inco-ordination of muscles:—The voice becomes thick and jerky owing to ataxic movements of the cords.

3. Spasmodic attacks:—Laryngeal crises often occur in the early stage and may precede other physical signs of the disease by three years.* They tend to disappear as abductor paralysis sets in.

An attack is announced by a feeling of irritation or tickling in the throat, followed by cough and a sensation of choking, caused by the spasmodic closure of the glottis, so that the patient rapidly asphyxiates, and falls down unconscious. The fall is sometimes averted by the glottis suddenly opening and allowing air to be drawn into the chest with difficulty, to the accompaniment of a long-drawn whoop. Unconsciousness may last from a few seconds to a few minutes, and is followed by a sense of mental confusion.

4. Paralysis of the cords, unilateral or bilateral, and primarily affecting the abductors.

In 84 cases of laryngeal paralyzes in ataxy, Burger found abductor paralysis, bilateral, 46 times, and unilateral 11 times; paralysis of abductor and of thyro-arytenoideus muscles, 8 times; complete recurrent paralysis in 6 cases.† Dorendorf found paralysis in 12 per cent. of tabetics, and crises in 3 per cent., while 3 per cent. showed jerky or ataxic movements of the cords.

Prognosis.—The laryngeal crises and spasmodic attacks vary much in intensity and frequency. They seldom cause death by asphyxia, but their occurrence exposes the patient to anxiety, and the risk of an attack in some public or dangerous position. Disorders of sensation require caution in eating and drinking. These spasmodic disorders are more frequent in the earlier stages, and tend to disappear with the progress of the disease.

Paralyzes may appear early, even years before the other symptoms of tabes, and are permanent and generally progressive.

Treatment.—These complications require the adoption of self-evident precautions. The attacks may be cut short by a cocaine spray, or the inhalation of nitrite of amyl or chloroform (cf. p. 563). The treatment of the paralysis is referred to at p. 563.‡

Disseminated sclerosis.—Palsies are rare. Anæsthesia of the larynx and palate may be complete.§

* C. A. Parker, *Proc. Laryngol. Soc., London*, iii., 1895-6, p. 46.

† Quoted by S. Moritz, *Journ. of Laryngol.*, 1894, viii. 374.

‡ S. Moritz, "The Laryngeal Manifestations of Locomotor Ataxy," *Med. Chron.*, May, 1894.

H. Dorendorf, "Larynx-Störungen bei Tabes." Berlin, 1903. (An elaborate monograph, with epitome of the literature to date.)

§ F. E. Batten and W. J. Horne, *St. Bartholomew's Hosp. Repts.*, vol. xxxii. W. Freudenthal, *Journ. Amer. Med. Assoc.*, June 13, 1908, p. 1966.

Glosso-labio-laryngeal paralysis.—Abductor paralysis may occur, and anæsthesia of the larynx is not uncommon. The affections of the tongue and soft palate in this disease are well known.*

Myotonia atrophica.—Three cases have been recorded, with laryngeal paralysis.†

Myasthenia gravis.—There is variability in the paresis of adduction and abduction of the vocal cords, associated with the symptoms of muscular weakness and rapid fatigue, difficulty of mastication and swallowing, and loss of voice.‡

Syringomyelia.—Anæsthesia and abductor paralysis are often present.§ There may be paralysis of the palate and pharynx, and chronic rhythmical spasm of the summit of the arytenoid.||

General paralysis of the insane.—Thirty-four cases were examined laryngoscopically by Permewan.¶ In nearly all these cases, in the second and third stage, there was diminished sensation in the pharynx and larynx. In 2 cases there was hyperæsthesia of the pharynx. In 7 there was more or less complete palsy of abduction of one or both vocal cords.

* Lannois and Charvet, *Ann. des Mal. de l'Oreille*, xxxix., 1913, No. 5, p. 425.

† H. Clayton Fox, *Roy. Soc. Med. Proc.*, Laryngol. Sect., iii., Nov., 1909, p. 20.

‡ E. D. Davis, *ibid.*, vii., Jan., 1914, p. 63.

§ Iwanoff, "Syringo-bulbia," *Zeit. f. Laryngol.*, i., No. 1.

A. Brown Kelly, *Journ. of Laryngol.*, xxvi., 1911, No. 8, p. 424.

|| Jobson Horne, *Proc. Laryngol. Soc., London*, iv., June, 1897, p. 104.

H. Tilley, *ibid.*, vi., Dec., 1898, p. 21.

¶ W. Permewan, *Journal of Laryngol.*, ix., Feb., 1895, p. 109.

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CHAPTER XL

STENOSIS OF THE LARYNX. ANKYLOSIS OF THE CRICO-ARYTENOID ARTICULATION

STENOSIS OF THE LARYNX

Synonym.—*Laryngeal stenosis.*

Narrowing of the larynx can only be correctly studied by reference to the various pathological conditions which cause it. But it may be convenient, even if it necessitate some repetition, to consider the subject as a whole, giving special consideration to the stenosis that not infrequently remains when the morbid process which inaugurated it is either past or stationary.

Etiology.—Acute laryngeal stenosis may occur in any of the affections which produce œdema of the larynx (*see p. 483*). It is met with in syphilis, wounds, scalds, injuries, foreign bodies, acute laryngitis, septic inflammations, diphtheria, membranous laryngitis, the exanthemata, and other acute phlegmons of the larynx. It has been known to occur quite suddenly in chronic tuberculous laryngitis. The symptoms of sudden, but temporary, stenosis are the leading feature of laryngismus stridulus and laryngeal spasm.

Stenosis may arise gradually in the course of tubercle, lupus, syphilis, leprosy, scleroma, simple or malignant new growths, perichondritis, wounds or injuries.

It may be due to congenital webs, congenital laryngeal stridor, adhesions between the cords, or recurrent laryngeal paralysis. If a tracheotomy is performed too high (when it often is really a cricotomy, or even a laryngotomy) it frequently leads to stenosis by interference with the action of the vocal cords. The too prolonged wearing of an intubation tube may lead, by pressure, to ulceration and stenosis—generally at the lower end in the neighbourhood of the cricoid cartilage. Statistics show that about 1 per cent. of patients intubated for laryngeal diphtheria are subsequently unable to breathe without an intubation or tracheotomy tube, generally as a result of chronic subglottic laryngitis.*

* J. Rogers, *Amer. Journ. Med. Sci.*, cxxv., No. iv.

Chronic stenosis is associated with the cicatrization following perichondritis. Ankylosis of the arytenoid joint, due to rheumatism or other causes, may effect a narrowing of the larynx, and the same may be produced by the laryngeal complications of typhoid fever, diphtheria, or smallpox.

When the larynx itself is affected, and still more when the subglottic region is the part attacked, the dyspnœa is more pronounced than when only the aditus ad laryngem is concerned. An amount of swelling in the latter region will possibly cause no interference with respiration, when in the subglottic region it would produce most alarming dyspnœa.

In the chronic forms of laryngeal stenosis, when the patient has become gradually accustomed to it, the amount of narrowing which can be tolerated is generally remarkable. In such cases the patient may not apply for relief until the glottic space has been reduced to a narrow chink, or until some acute or subacute affection is grafted on to the cause of the stenosis.

The most frequent cause of laryngeal stenosis is the ulceration of the tertiary form of laryngeal syphilis (Fig. 286, p. 689).

Pathology.—This must be studied under the headings of the various etiological factors.*

Symptoms.—The chief symptoms are dyspnœa, stridor, and alteration or extinction of voice. All are more marked on exertion. The patient prefers to sit up, with the head thrown backwards, as he struggles for air. It is said that cyanosis becomes marked, but in the chronic form of stenosis it is remarkable that, even when the patient is gasping for breath, with anxious and cold perspiring face, and the extra-ordinary muscles of respiration working visibly, there may be no marked cyanosis. More commonly there is a pale and somewhat leaden hue. The larynx is seen to sink towards the thorax with each inspiration. The stridor is chiefly inspiratory, and is louder than that made in tracheal stenosis. This laryngeal stridor is more metallic, and the cough more brassy and barking, than in narrowing of the windpipe, when the voice is more wheezing and blowing. The alteration of voice will depend on the situation and nature of the stenosis. Hence it may scarcely be affected or be even louder and harsher than normal; it may be absent; or it may be accompanied by "phonative waste" when the cords are prevented from meeting. The diagnosis from tracheal stenosis is given on p. 586. Many of the symptoms of acute stenosis are referred to under the headings of Injuries and Fractures, Œdematous Laryngitis, Laryngeal Diphtheria, and Laryngismus Stridulus.

* Chevalier Jackson, *Trans. Amer. Laryngol. Assoc.*, xxxv., 1912, p. 189.

Prognosis.—In many conditions stenosis tends to spontaneous resolution. In the acute form this will depend entirely on the cause. It is serious if due to diphtheria, or to the impaction of a foreign body. When malignant disease or tuberculosis is so advanced as to cause stenosis, relief by tracheotomy is required. In chronic stenosis there is no tendency to spontaneous recovery, and, if progressive, it inevitably leads to death by asphyxia. Treatment, however, will not only avert this, but in many cases will remove all further risk of it, although the cure of the actual stenosis in the larynx is notoriously unsatisfactory.

Treatment.—For the treatment of the acute form, reference must be made to the chapters dealing with the affections which cause it (pp. 469, 473, 482, 483, 722).

The treatment of the chronic form will also depend to a large extent on the pathological conditions, and advice should be sought under the various sections describing them. Speaking generally, the three chief methods of relief are by medication and intralaryngeal treatment, by intubation, and by tracheotomy.

The frequency with which stenosis follows syphilis of the larynx forms the most earnest plea for careful and complete treatment of the first symptoms of the disease in this region. But even when stenosis is threatening, and surgical relief appears almost inevitable, it is remarkable how the symptoms will often subside with an injection of salvarsan, followed up with active mercurial treatment by inunctions, fumigations, or hypodermic injections. When the dyspnoea demands immediate relief, this should always be secured by the performance of a tracheotomy. The physiological rest which is thus secured for the larynx not only helps to spontaneous resolution of the inflammatory products there, but renders specific treatment much more effective.

If the stenosis is due to bilateral abductor paralysis, this might be temporarily relieved by intubation, but for a permanency it is more desirable that the patient should wear a tracheotomy tube.

The stenosis resulting from other cicatricial conditions may be overcome by the use of a suitable intubation tube, which may be left *in situ* for months at a time.* A fibrous stricture apparently requires at least two years of continuous dilatation to the utmost limit of the normal lumen of the respiratory tract before it can be considered as permanently overcome. Three to six years of

* John Rogers and Bryson Delavan, *Trans. Amer. Laryngol. Assoc.*, xxvii, 1905, p. 79.

Emil Mayer, *N.Y. Med. Record*, Dec. 25, 1909.

dilating tubage have been required in some cases.* An intubation tube of hard rubber—which is preferable to metal for prolonged use—has been worn continuously for four years.† In this prolonged treatment it is useful to employ vulcanite tubes with a well-marked shoulder below the neck, so as to prevent extubation. Another method of preventing the tube from being coughed out is to have it made long enough to descend below the tracheotomy wound, through which it is secured with a clamp (Fig. 258).‡ Good results have been obtained by the wearing of some form of T-shaped tracheotomy tube.§



Fig. 258.—Clamped intubation tube.

Webs or cicatrices may be divided by a guarded laryngeal knife or by Whistler's cutting curette, or the galvano-cautery, or removed with the intralaryngeal punch or other forceps. After these surgical measures great care must be taken to prevent re-formation of the cicatrix between the wounded surfaces. Some cases may require the performance of laryngo-fissure. In a large number of cases tracheotomy must be done, not only for immediate relief, but as a safeguard against any sudden increase in the constriction.

When a tracheotomy has been performed too high, and stenosis prevents subsequent discontinuance of the cannula, cure is sometimes effected simply by opening the trachea lower down (cf. Fig. 323, p. 782).

* D. Bryson Delavan, *Journ. of Laryngol.*, xxiv., 1909, No. 11, p. 585.
StClair Thomson, *Proc. Roy. Soc. Med.*, Laryngol. Section, vol. iii., Dec., 1909, p. 35.

† William K. Simpson, *Trans. Amer. Laryngol. Assoc.*, 30th Congress, 1908, p. 52.

‡ H. Barwell, *Lancet*, 1915, i., Jan. 2, p. 16.

§ H. Koschier, *Wien. klin. Woch.*, xxi., 1908, No. 16, April 16, S. 580.
L. Harmer, *ibid.*, S. 559.

Laryngostomy, suggested by Killian and by surgeons in Italy,* and recently developed in France and Belgium,† is suitable for inveterate cases of cicatricial stenosis. It is carried out as follows: A low tracheotomy is performed. The larynx is split, and, if the trachea is also stenosed, it is divided lengthwise and precisely in the middle line. The mucosa and skin of each side are stitched together. In the canal thus formed is placed a red rubber drainage-tube, or a suitable round stick of wood wrapped in iodoform gauze and fixed with silk ligatures to the neck. It is freely smeared with vaseline and covered with dressing. This tube produces softening and absorption of cicatricial tissue. Beginning with sizes 15 or 16, the calibre is worked up to No. 31. The new canal is formed of granulations and gets cicatrized from the skin. When a sufficiently large lumen has been secured, the air-tube is closed in by refreshing the margins of the canal and performing a plastic operation.‡ This process may take three or four months, as progress is very slow. The changing of the dressings is painful and tedious, and the course of treatment so exhausting, to both patient and practitioner, that it should be reserved for selected cases, and for those in which a cure cannot be expected from intubation. Of 37 patients treated by laryngo-tracheostomy, 6 died—a mortality of 16·3 per cent. Of the remaining 31, only 14 were considered entirely cured (Delsaux).

ANKYLOSIS OF THE CRICO-ARYTENOID ARTICULATION

The crico-arytenoid joint possesses a loose capsule, and stiffness in or around the joint is not so exceedingly rare. The ankylosis may be true or false. It may result from comparatively simple causes, and be present in an otherwise healthy subject.

* U. Melzi and A. Cagnola, *Ann. des. Mal. de l'Oreille*, xxxiv., ii., 1908, No. 11, p. 536.

† Sargnon and Barlatier, *Journ. of Laryngol.*, xxiii., 1908, Nos. 7, 8, and 9.

Sargnon and Barlatier, *Rev. Hebdomadaire de Laryngol.*, xxx., ii., 1909, No. 37.

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A. Thost, "Die Verengerungen der oberen Luftwege nach dem Luftröhrenschnitt und deren Behandlung." Wiesbaden, 1911.

Delsaux, *Brit. Med. Journ.*, Oct. 16, 1909, p. 1141, and *Journ. of Laryngol.*, xxiii., 1909, p. 365.

A. Iwanoff, *Zeitschr. f. Laryngol.*, 1909, Bd. ii., Heft 3, S. 241.

Rabot, Sargnon, and Barlatier, "Rétrécissements du Larynx et de la Trachée consécutifs au Tubage et à la Trachéotomie," 1 vol. Paris, 1908.

Moure and Richard, *Ann. des Mal. de l'Oreille*, xxxix., 1913, No. 9, p. 194.

Sargnon, *ibid.*, p. 238; and *Proc. XVIIIth Internat. Cong. Med.*, London, 1913, Section xv., Part ii., p. 429.

‡ Chevalier Jackson, "Laryngostomy," *Laryngoscope*, xix., Sept., 1909, No. 9, p. 690. (Gives a full bibliography.)

Etiology.—Fixation of this joint has been attributed to perichondritis from syphilis or gout. These affections more commonly impair the movements of the joint by deposits outside the capsule, as do cancer, syphilis, tuberculosis, and pachydermia. Blows, fractures, strangling, cut-throat, and traumatism may lead to false ankylosis. Acute local inflammation induces it, and so it may be consequent on acute pharyngitis, tonsillitis, diphtheria, enteric, and the exanthemata.

The joint is apt to be implicated in rheumatism, and if it is the only articulation affected, the symptoms may be mistaken for those of acute perichondritis. Rheumatic crico-arytenoid arthritis may be acute or subacute. If acute, there is always pyrexia, the condition is generally bilateral, and other joints are affected. If subacute, there may be no pyrexia, and the arthritis is almost always unilateral. The crico-arytenoid may be the first joint to be attacked in acute rheumatism, or it may be involved simultaneously with, or later than, the others, or during a relapse. In all acute cases there is dyspnoea, and the necessity for tracheotomy may appear urgent.* It is possible that gonorrhoeal rheumatism may attack this joint.

In recurrent paralysis of the cord of some standing, the crico-arytenoid joint becomes ankylosed from disuse.

Symptoms.—The attack will vary with the nature of the affection causing it. The voice varies; if the cord is fixed in the median position, it may hardly be altered; if in the cadaveric position, it may be impaired. If the affection is bilateral, the voice is rough or hollow, but is not necessarily lost, although dyspnoea in such cases is marked, and in acute conditions may produce rapid asphyxia. When unilateral, breathing is easy, except temporarily when there is any congestion of the larynx. There may be pain and stiffness, with slight discomfort in swallowing.

Examination.—The ankylosis of the crico-arytenoid joint is chiefly manifested by the fixation of the vocal cord. This may occur in any position, according to the limiting lesion. It is usually in the cadaveric position (Fig. 247, p. 538), or anywhere between that and the middle line. In bilateral ankylosis the position of the cords is not necessarily symmetrical. In true ankylosis the fixation of the cord is complete; in false ankylosis there is generally some movement, and the lesion impeding the action of the joint is often visible.

Diagnosis.—The position of the vocal cord in these cases is so strongly suggestive of recurrent paralysis (p. 559) that the diagnosis is often difficult, especially in paralyses of some standing, when the crico-arytenoid joint becomes fixed from disuse. Any tumefaction around the arytenoid, with fixation of the cord, is suggestive of ankylosis. The other diagnostic differences are given at p. 562.

Prognosis.—False ankylosis may disappear with the removal of the limiting cause. True ankylosis of the joint cannot recover; but the voice with use may improve considerably. In bilateral ankylosis

* E. Baumgarten, *Wien. med. Woch.*, Oct. 17, 1903, No. 42, S. 1970.

tracheotomy might be required. The differentiation from a paralysis of the vocal cord relieves the patient of anxiety he might have in regard to serious chest or nerve lesions causing it.

Treatment.—Treatment will depend on the recognition of the cause. In acute cases the laryngitis is treated on ordinary principles (p. 481). If the affection is bilateral, and there is any stenosis, as indicated by stridor in sleep, a tracheotomy should not be delayed. If there is any suspicion of rheumatism, the salicylates will be given, and specific treatment if syphilis appears to be the cause. Chronic cases of some standing are best left alone. The voice and breathing capacity can be much improved by vocal and pulmonary gymnastics. Dilatation of the stenosis by intubation tubes or Schrötter's bougies has not yielded good results.

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S. H. Mygind, *Arch. f. Laryngol.*, Bd. xxviii., Heft 1.

PART VII.—DISEASES OF THE TRACHEA AND ŒSOPHAGUS

CHAPTER XLI

DISEASES OF THE TRACHEA

Anatomical considerations.—The trachea extends from the lower part of the 6th cervical to the 4th dorsal vertebra. It is about $4\frac{1}{2}$ inches in length. Being surrounded by loose connective tissue, there is a good deal of up-and-down movement allowed to the tube in breathing and swallowing. This mobility is more marked in children than in adults. The distance from the cricoid cartilage to the top of the sternum also varies with the length of the neck and position of the head. In an adult the full distance is about $2\frac{3}{4}$ inches (7 cm.); in a child it varies between $1\frac{1}{2}$ inches (4 cm.) for a child of 3 to 5 years, and $2\frac{1}{4}$ inches (6 cm.) for a child of 8 to 10 years.

The extreme width is frequently given as between $\frac{3}{4}$ inch and 1 inch. But the researches of Nicaise and Lejars have shown that the diameter of the trachea is very different in life from what it is in the cadaver. Instead of being 16·7 mm. at the first ring and 18 mm. at the ninth, the diameters in the living subject are respectively 12 mm. and 11·8 mm.—a width of about $\frac{1}{2}$ inch.

A rough estimate of normal measurements, according to Bryson Delavan, is obtained by a comparison with the patient's index finger, which is somewhat near the calibre of his trachea below the cricoid. The length of this finger is about the distance from the suprasternal notch to the tracheal bifurcation.*

Examination.—The method of viewing the trachea with the laryngeal mirror has been described at p. 41. The portion of the trachea just below the glottis is the least visible, owing to the narrowing of the subglottic region and the shadow thrown by the vocal cords. In some cases one or more of the tracheal rings are exceptionally white and prominent. This physiological condition must not be mistaken for true calcareous excrescences.† Direct tracheoscopy is described at p. 48.

Abnormalities are uncommon. The rare congenital defect in which the œsophagus communicates with the trachea is described at p. 599.

* *Trans. Amer. Laryngol. Assoc.*, 1905.

† E. Law, *Brit. Med. Journ.*, Aug. 30, 1902, p. 571, or *Journ. of Laryngol.*, Oct., 1902.

TRACHEOCELE

A tracheocele is a gaseous tumour of the neck connected with the windpipe, soft, resonant, often reducible under pressure or on respiration, and generally painless. It is a very rare affection. It appears to be caused generally by strain. A weak spot, congenital or acquired, gives way. In addition to these tracheoceles, formed by distension, there are others due to rupture of the trachea from tubercular, syphilitic or traumatic change in the walls. Strain alone cannot produce a rupture. Pathologically, tracheoceles are divided into those due to weakness of the walls and those due to rupture. In the first, the pouch is lined with tracheal mucous membrane, and is comparable to a hernia. In the second group, we have to do with a new formation. The content of the pouch is air, sometimes mixed with a yellow liquid.

Symptoms.—Most cases are small, and have existed for years without symptoms.* Tracheoceles are situated in the middle line, or in the supraclavicular depression on one or other side. They form globular enlargements, and the skin over them is not altered. In size they vary from a pigeon's egg to a Tangerine orange, although those due to rupture of the trachea may sometimes become voluminous. They increase in forced expiration and diminish during inspiration or movements of the neck. When reduced by pressure there is a dry sound like that produced by a valve. Sometimes they are fluctuating, generally soft and elastic. They are resonant under percussion, painless, but sometimes cause inconvenience in breathing or swallowing. Dyspnœa and attacks of suffocation have been noticed, but dyspnœa is rare.

Diagnosis is not difficult. Tracheoceles must be distinguished from recent subcutaneous emphysema, hernia of the lung, acute inflammation, abscess, enlarged glands, goitres and aneurysms.

Prognosis is favourable unless there is some serious cause producing rupture of the trachea.

Treatment.—Some mechanical support might be required, but surgical interference could only produce a worse condition than the disease.

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F. Klaussner, "Ueber Tracheocele und Blähkropf," *Münch. med. Woch.*, Oct. 22, 1895, No. 43, S. 997.

INJURIES AND FRACTURES

These are rarely met with in practice, and the symptoms and treatment would be very similar to what has already been described in regard to traumatism of the larynx (*see* p. 469).

It is well to remember that syncope and collapse may be a striking symptom and apparently out of proportion to the degree of injury, so that some reflex cardiac paralysis must be invoked as the active cause of shock.

* James E. Newcomb, *Trans. Amer. Laryngol. Assoc.*, 1906, p. 251.

Tracheotomy may be required, and a chief indication is to secure rest to the windpipe, and at the same time arrest reflex shock, by hypodermics of morphia.*

STENOSIS OF THE TRACHEA

Stenosis is so frequently a symptom, often the only one, of various tracheal affections that it requires detailed consideration.

Etiology.—Narrowing of the lumen of the trachea may be due (A) to obstruction within it, or intrinsic causes, or (B) to compression from the outside, or extrinsic causes.

A. Intrinsic causes :—

1. Cicatrices and adhesions of traumatic, operative, or inflammatory origin.
2. New growths.
3. Foreign bodies.
4. Tertiary syphilis, leprosy, scleroma, tuberculosis.
5. Œdematous inflammation, including the consequences of inhalation of smoke and volatile fumes, or the aspiration of corrosive chemicals and acids.
6. Injuries and wounds.
7. Penetration into the trachea of caseous lymphatic glands, aneurysms, thyroid tumours, and malignant growths in the neighbourhood.

These causes are met with more rarely than the extrinsic ones.

B. Extrinsic causes :—

(a) *Compression in the neck :*

1. Goitre (the most common cause).
2. Enlarged glands and new growths (innocent or malignant) in the neck.

(b) *Compression in the thorax :*

1. Substernal goitre ("goitre plongeant").
2. Enlarged or tuberculous glands.
3. Enlarged thymus gland. Abscess of thymus gland.
4. Aneurysm.
5. Cervical phlegmon and abscess.
- 6. Foreign bodies impacted in the œsophagus.
7. Bone disease extending from the sternum, clavicle, or vertebræ.
8. Traumatism, as in fracture or rupture of the trachea, cut throat, strangulation.
9. Subcutaneous emphysema arising in cut throat or injury.
10. Growths of the œsophagus.
11. Malignant growths of the mediastina (more apt to compress the bronchi).

A. Intrinsic causes.—The cicatrices and adhesions causing stenosis in the trachea are, in the large majority of cases, the sequelæ of tertiary syphilis (Fig. 286, p. 689). Next in importance come

* Zimmermann, "Zur Kenntnis der isolierten Trachealfrakturen," *Arch. Laryngol.*, Bd. xxiv., Heft 3, S. 466.

the results of tracheotomy and intubation. New growths are considered on p. 590.

Foreign bodies which enter the trachea by the mouth are referred to on p. 742. In addition, the windpipe may be penetrated by morbid processes and allow the ingression of foreign substances through its walls. Thus a caseous broncho-tracheal gland may ulcerate through into the lumen of the windpipe, and cause death by slow dyspnœa* or by sudden asphyxia† (Fig. 291, p. 743).

Tertiary syphilis does not cause stenosis nearly so often by gummatous proliferation as by the subsequent cicatricial stenosis. Tuberculosis may cause stenosis by tumour-formation, or by perichondritis and exfoliation of the tracheal rings. In leprosy and scleroma the invasion of the trachea in late stages of these diseases causes slowly and steadily progressive stenosis.

B. Extrinsic causes.—External compression produces tracheal stenosis more frequently than any intrinsic cause, and of all external causes the most common is goitre (Fig. 259). Invasion of the trachea does not depend on the size of the thyroid enlargement, but on the situation and nature of the hypertrophied portion. The trachea may be narrowed to a scabbard-like slit, and its walls be quite softened. This condition impels the patient to carry his head in a more or less fixed attitude, and if this is abandoned (as in sleep) death may occur suddenly. The thyroid growth may also compress the œsophagus and involve the recurrent laryngeal nerves (*see* p. 556).

The approximate weight of the average thymus gland is 13·26 gm. in newly born children, 23 gm. between the ages of 5 and 10, 26 gm. between 6 and 10 years, and 37·52 gm. between 11 and 15 years. After that age it rapidly diminishes until it weighs only 6 gm. in advanced life.‡ A gland has been found in the post-mortem examination of a child of 1½ years to weigh 14 drms. (50 gm.),§ and in a boy of 13 I have seen one weighing 56·7 gm. (2 oz.). In a child aged 8 months it has been found converted into an abscess the size of a small apple.|| The enlarged thymus can be detected by radiography (*cf.* p. 317).

An enlarged thymus may produce symptoms by causing tracheal stenosis, or by producing circulatory disturbances from pressure on the large vessels, or by toxic effects. It is possibly one over-

* Bransby Yule, *Brit. Med. Journ.*, Aug. 19, 1905, p. 385.

† G. Herbert Metcalfe, *Lancet*, May 25, 1901, p. 1465.

‡ Hammar, *Vierteljahr. f. Gericht. Med.*, Bd. xxxvii., Heft 1.

§ James Rooth, *Brit. Med. Journ.*, March 21, 1906, p. 737.

|| H. Cohn, *Deut. med. Woch.*, Aug. 30, 1906, p. 1418.

looked cause of the sudden deaths in infants which are sometimes attributed to overlying.*

With the aid of direct tracheoscopy Chevalier Jackson has



Fig. 259.—Stenosis of the trachea.

A, Shows the ordinary bilateral flattening of the trachea produced by parenchymatous goitre and other forms of symmetrical enlargement of the thyroid. From a girl aged 13, who died of suffocation caused by the goitre. (James Berry.)

B, Shows the ordinary flattening and curving of the trachea produced by unilateral goitre. From a man aged 49, who died of heart disease. (James Berry.)

been able to demonstrate that the so-called "thymic asthma" is really a mechanical compression of the trachea, which was

* G. Avellis, *Arch. f. Laryngol.*, Bd. viii., Heft 1.

L. S. Dudgeon, *Trans. Path. Soc., London*, Dec. 1, 1903.

reduced to a chink of 1 to 2 mm. The dyspnœa from this stenosis increased with expiration and on sitting erect. Complete cure was effected by removal of the thymus gland.*

Symptoms of tracheal stenosis.—If tracheal obstruction comes on gradually, a degree of stenosis can be tolerated which would cause asphyxia if it occurred suddenly (compare Laryngeal Stenosis, p. 574). There are three stages of symptoms: 1. Respiration is free, except for laboured respiration on physical exertion. 2. There is continuous and well-marked noisy respiration, and the voice is weak. 3. There are, in addition, paroxysms of suffocation. In slowly progressive stenosis the onset of dyspnœa is insidious, is generally constant, but at times becomes paroxysmal in character and closely resembles an asthmatic seizure. The stridor, which supervenes in well-marked cases, accompanies both the inspiratory and expiratory acts, but is most pronounced with inspiration. Some years ago Gerhardt drew attention to the fact that in tracheal stenosis the respiratory excursions of the larynx are very slight, whereas in stenosis of the larynx these movements are often pronounced, the larynx descending with inspiration considerably more than 1 cm., and ascending again with expiration. His explanations of this are not universally accepted as satisfactory, and neither laboratory experiment nor clinical experience has completely verified Gerhardt's statement concerning the relative degree of respiratory excursions of the larynx in stenosis of the larynx and trachea.† A patient suffering from tracheal stenosis assumes a characteristic attitude. He prefers to sit up, with the chin somewhat depressed, and the head thrown slightly forwards. In laryngeal stenosis the head is always more or less thrown back. Gerhardt considers that the first position is designed to relax the trachea as far as possible, and thus to give more room; whereas the extended position of the head in laryngeal stenosis has the effect of compressing the anterior surface of the cricoid cartilage and causing a slight rotation on its articulating surfaces whereby the vocal cords are relaxed.

The voice is not characteristic; it is generally clear, but faint or muffled from the diminished force of the expiratory current. There is often visible effort in phonation. Cough may be absent, its presence depending on the nature and situation of the obstructing lesion. Stridor is at first faint, distant, and only occasional. It is increased on making any exertion; and is generally more marked on inspiration. It is often denied by a patient and over-

* *Journ. of Amer. Med. Assoc.*, xlviii., May 25, 1907, p. 1753.

† Percy Kidd, *Clin. Journ.*, Dec. 30, 1896.

looked by his friends. Suspected cases should be reported on by someone who listens to them at night, when the characteristic "mewing" or "blowing" sound is always more marked.

Inspiration is longer than expiration, and has not the peculiar brassy, croupy, or stridulous sound of laryngeal dyspnœa. The patient may complain of an oppressed, suffocative feeling.

Physical examination of the chest discloses weakness of the breath-sounds on both sides (if the obstruction is in one bronchus, only one side of the chest will show this), and, as a rule, more or less persistent rhonchus and tracheal breathing over the course of the trachea, i.e. down the sternum. It is not uncommon in such cases to find that breathing of a tracheal or tubular quality may be found over the apices of the lungs. In such circumstances consolidation of the lungs should not be diagnosed unless there is, at the same time, some degree of dullness on percussion.

Changes in the pulse-rate, distension of the cervical veins, retraction of the supraclavicular fossæ, and cyanosis are other symptoms common to dyspnœa, from any cause. When stenosis occurs suddenly, as when a tubercular gland bursts through into the trachea, the symptoms are those of sudden death from asphyxia.

Examination.—The laryngoscope not only serves to exclude the question of laryngeal stenosis—or confirm it, if both conditions are present—but with the Killian position (p. 41) and good illumination the whole length of the trachea can frequently be seen reflected in the laryngeal mirror. If a laryngeal cause for the stridor is excluded, and physical examination of the chest does not explain the dyspnœa, we can feel fairly confident in diagnosing the existence of tracheal stenosis. Direct tracheoscopy, the X-rays, and examination of the œsophagus, neck and chest, may all be necessary to determine the site of the obstruction and its cause.

Prognosis.—This will depend on the cause, situation, and degree of stenosis. When the lumen of the windpipe is reduced to a chink, the slightest engorgement is sufficient to shut off the supply of air. A fatal termination may thus occur suddenly. Even an early tracheotomy may not avert danger when the stenosis is at the lower end of the windpipe, or invades the bronchi.

Treatment.—This must be directed to the various causes. The patient with decided tracheal stenosis must avoid hurry and exertion. Excitement, emotion, vitiated air, heavy meals, in fact anything which can embarrass respiration, circulation, or digestion, might prove dangerous. When syphilis is diagnosed, or even suspected as the cause, salvarsan, active mercurial treatment, and rest in bed are urgently indicated.

For temporary stenosis a tracheotomy is generally required. For progressive or established conditions the tube may have to be worn permanently. It will give relief only if the windpipe can be opened at or below the narrowed point, even though a con-

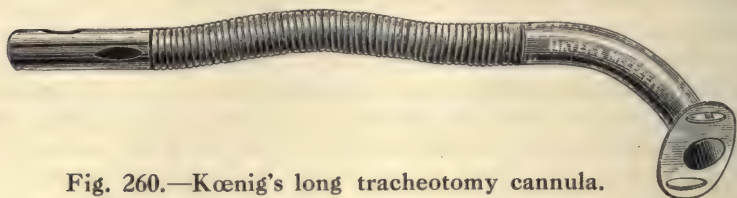


Fig. 260.—Koenig's long tracheotomy cannula.

striction lower down can sometimes be passed with a Koenig's long tracheotomy tube (Fig. 260). For the cure of established cicatricial stenosis the best results are to be expected from the operation of tracheostomy, with, possibly, laryngostomy (p. 578).

INFLAMMATORY DISEASES

The trachea shares, more or less, in laryngitis and bronchitis. The infections of influenza, diphtheria, scarlatina, and other fevers may descend to the windpipe. Scleroma and syphilis invade it. It shares in the results of laryngitis sicca, and not only suffers from the unpurified air which reaches it from ozæna, but crusts similar to those in the nose may be found in it (tracheal ozæna). The trachea may be invaded by the extension of diseases of the œsophagus, thyroid gland, or cervical cellulitis.

When perforation of the tracheal wall takes place, the formation of a fistula with the œsophagus is shown by the symptoms of cough, the expulsion of food through the larynx, and the onset of septic pneumonia.

Perichondritis of the tracheal rings may result from injury, enteric fever, syphilis, or tuberculosis.

Hæmorrhage from the surface of the windpipe may be due to influenza or result from the presence of varicose veins (Massei). It is an alarming symptom when due to erosion of the walls by an aneurysm (*see* p. 459). Œdema rarely occurs in the trachea.

The **symptoms** of inflammation of the trachea are generally overshadowed by or blended with those of the accompanying laryngitis. The chief ones are cough, secretion, and dyspnœa. Dyspnœa is seldom marked until the stenosis is well established, when it may come on acutely from any aggravation of the inflammatory condition. In regard to cough, the anterior and lateral walls are very insensitive, and secretion can frequently be seen

adhering to them and causing little discomfort. The membranous posterior wall of the windpipe is much more irritable, particularly just below the glottis. Sputum travels upwards by the action of the cilia until it reaches this spot, where cough is stimulated for its expulsion. The bifurcation, or carina, is also a sensitive region.

The diagnosis between laryngeal and tracheal stenosis is given on p. 586.

SYPHILIS OF THE TRACHEA

Erythema, mucous patches, gummata, perichondritis, and subsequent cicatricial stenoses are met with (Fig. 286, p. 689). More or less diffused gummatous infiltrations are more common than the localized gumma. They occur most frequently at the lower end of the tube, near its bifurcation; next in frequency come extensions from the larynx; and, lastly, those situated midway between these points. Syphilitic ulceration and stenosis may extend into the main bronchi.* Complications occur from perforation of the œsophagus, aorta, pulmonary artery, or vena cava; but the most common sequela is stenosis.

Syphilitic ulcerations of the trachea are considered to be of rare occurrence. In the majority of textbooks on surgery and diseases of the throat, no mention is made of these lesions, and Morell Mackenzie states that the affection is rare, and that he has seen "only three cases amongst 1,145 patients suffering from syphilis of the pharynx, larynx, and trachea." Later experience shows that syphilitic ulceration cannot be so uncommon, judging from the not infrequent cases which only come under notice when cicatricial contraction and stenosis attract attention.

Syphilitic stenosis of the main bronchi, without a similar condition in the trachea, is extremely rare.†

Diagnosis is sometimes assisted by the detection of syphilitic disease, or its scars, in the nose, pharynx, or larynx, but in many cases these aids are not forthcoming, and then the cause of the stenosis is arrived at by inspection, or by direct tracheoscopy (p. 48), after the other causes of extrinsic or intrinsic tracheal stenosis have been excluded (*see* p. 584). Serious syphilitic stenosis of the trachea has been met with in a young girl of 17.‡ A positive Wassermann reaction would strengthen the diagnosis, but a negative one would not exclude the possibility of contracting scars being the relics of parasyphilis.

* Percy Kidd, *Proc. Laryngol. Soc.*, London, iii., 1895, p. 18; *Clin. Journ.*, Dec. 30, 1896.

† H. D. Rolleston and Cyril Ogle, *Clin. Soc. Trans.*, xxxii., April 14, 1899. Samuel Wilks, *Guy's Hosp. Repts.*, ix., 1863, p. 37.

‡ Walker Downie, *Brit. Med. Journ.*, Oct. 14, 1899.

The **prognosis** will depend on the degree and the depth of the stenosis. In cases where the contraction is low down, or cannot be relieved, or extends into the bronchi, the outlook is very grave.

Treatment must be prompt. Strict rest in bed should be secured, and the patient at once submitted to energetic mercurial treatment by inunction, if the symptoms are not very urgent, or by intravenous injection of salvarsan ("606"), or intramuscular injections of grey oil or calomel (*see* Chap. XLIX.). Inhalation of the fumes of sublimed calomel will be indicated if there is also ulceration in the trachea. A tracheotomy may be required, and should be performed as low as possible. If this fails to give relief, a Kœnig's long tube may succeed in getting below the narrowing.

TUMOURS OF THE TRACHEA

Primary growths of the trachea are exceedingly rare. In sixteen years' experience, Morell Mackenzie saw but 4 cases. Among 3,120 tumours of the upper respiratory tract seen by Moritz Schmidt there were only 7 tracheal new growths.* In 1908 the records of published cases of neoplasms of the trachea (innocent and malignant) amounted to 201 cases.† The latest additions bring the total up to 251 cases of tracheal growths, of which 160 were innocent, 77 malignant, and 14 of unknown or doubtful character.‡

Neoplasms occur most frequently in the upper part of the trachea, and their frequency diminishes as the tube descends. They are found most often on the posterior wall. As this area is rich in lymphatics it is a most unfortunate situation for malignant growths.

BENIGN GROWTHS

Papilloma, fibroma, adenoma, lipoma, enchondroma, chondro-osteoma, and aberrant thyroid tissue tumours have been met with.§ Papillomata and fibromata are, as in the larynx, the most common. Papillomata, the most frequent of all, are generally extensions from the larynx, and hence chiefly occur in young children (*see* Fig. 241, p. 521). Of fibromata, which come next in frequency, 29 cases have been published.||

* "Die Krankheiten der oberen Luftwege," dritte Auflage, S. 627. Berlin, 1903.

† E. Krieg, *Beiträge zur klin. Chirurgie*, lviii., 1908, p. 162.

‡ Lombard and Baldenweck, *Ann. des Mal. de l'Oreille*, xl., 1914, No. 5, p. 491.

R. H. Woods, *Journ. of Laryngol.*, xxviii., 1913, No. 10, p. 509.

E. V. Segura, *Ann. des Mal. de l'Oreille*, xxxix., 1913, No. 8, p. 162. (Case of a cylindroma.)

§ Otto T. Freer, *Journ. of Amer. Med. Assoc.*, March 30, 1901, p. 876.

Theisen, *Amer. Journ. of Med. Sci.*, June, 1902, p. 1051.

|| William E. Sauer, *Laryngoscope*, xviii., 1908, p. 252.

MALIGNANT GROWTHS

Most of the malignant growths met with in the trachea are but extensions from the larynx, œsophagus, or mediastinum. This group forms nearly a third of Krieg's collection of 201 cases, so that a strong suspicion of malignancy must always attach to a tracheal tumour.* Carcinoma is met with twice as often as primary sarcoma. Thirty primary cases have been recorded.† Secondary carcinoma is the most frequent form of malignant disease attacking the trachea. But sarcomata are relatively much more frequent here than they are in the larynx. Sarcoma is usually situated on the posterior and lateral walls; it develops slowly, and does not show a marked tendency to ulcerate.‡ Sarcoma has been met with at the bifurcation of the trachea, secondary to the same disease in the left kidney.§

Symptoms.—Symptoms may only be noticed when there is a considerable narrowing of the trachea, so that tumours may be latent for years. Dyspnoea is usually the first thing complained of. This may occur suddenly and fatally. The voice is usually enfeebled, though not lost. Hoarseness will depend on the degree to which the cords are involved by catarrh. In cases of malignant growths there may be blood-stained sputum, pain, and cachexia. In some cases the early involvement of the œsophagus may lead to dysphagia as a leading symptom.|| Secondary symptoms are due to bronchitis, bronchiectasis, and atelectasis.

Death may occur (a) by suffocation, sudden or gradual, (b) by pneumonia, or (c) by hæmorrhage from erosion of large arteries of the neck.

Diagnosis is made by direct inspection. It may be arrived at by exclusion of diseases of the thyroid and œsophagus. Aneurysm must be carefully sought for, not omitting the use of radiography.

The **prognosis**, if the case cannot be operated on, is unfavourable. It is very grave in cases of carcinoma. Sarcoma has been known to extend over a period of years.

Treatment is either palliative or operative. A low tracheotomy will give relief in the majority of cases, as statistics show that over one-half of all cases of tracheal neoplasms are situated in the upper third of the windpipe. If the growth is lower down,

* Theisen, *Trans. Amer. Laryngol. Assoc.*, 1906, p. 264. (Gives a full bibliography of tumours of the trachea.)

J. M. Ingersoll, *ibid.*, xxxvi., 1914, p. 90.

† T. Passmore Berens, *ibid.*, 1909, p. 70.

‡ Otto Kahler, *Wien. med. Woch.*, lviii., 1908, S. 906

§ St. Bartholomew's Hosp. Museum, No. 1638A.]

|| E. Simmel, *Arch. f. Laryngol.*, Bd. xxiv., Heft 3, S. 499.

an attempt must be made to pass a Kœnig's long cannula past it. (Fig. 260, p. 588.) In an emergency a piece of a rubber stomach-tube might be used.

Innocent growths can be removed by direct laryngo-tracheoscopy (p. 46), or by a tracheotomy (p. 775), with, in addition, division of the cricoid, or even of the lower part of the thyroid (p. 788). The direct route is not suited for malignant growths. If operable they should be exposed by splitting the anterior wall of the trachea for a considerable distance.

Intratracheal injections are recommended by several observers in various chronic affections of the windpipe—tracheitis, syphilis, tubercle—and in asthma. Their most useful indication is fetid bronchiectasis. The basis of the injection should be pure olive oil, or some such hydrocarbon oil as that sold under the name of benzoinol. A drachm of this is used, although some



Fig. 261.—Intratracheal syringe.

recommend as much as an ounce. With this basis the following drugs may be incorporated, according to the nature of the case, namely, guaiacol 2 per cent., and menthol 10 per cent. (Grainger Stewart); salol and euphraphen (Bronner); ichthyol 2 per cent., and menthol-camphor 5 per cent. (Anderson); menthol 5 per cent., euphraphen 5 per cent., and boric acid 3 per cent. Bromoform, iodoform, turpentine, and salol are less frequently used. The favourite drug is simply menthol in strengths of 1 to 5 per cent. Donelan's syringe is a useful instrument for introducing the drug well below the vocal cords.*

Intratracheo-bronchial injections for asthma have been introduced by Ephraim. These are administered through a bronchoscope, and consist, as a rule, of 5 c.c. of a 1 per cent. solution of cocaine or novocain and adrenalin. The technique is a little complicated and alarming for nervous patients.†

* T. Hubbard, *Trans. Amer. Laryngol. Assoc.*, 1904, p. 83.

J. W. Gleitsmann, *N.Y. Med. Record*, March 25, 1905.

† Henri Bourgeois, *Bull. de l'Acad. de Méd.*, April 21, 1914; and Epitome, *Brit. Med. Journ.*, July 4, 1914.

- M. Zondek, "Papilloma of the Trachea," *Berl. klin. Woch.*, Feb. 3, 1908. (From ref. in *Lancet*, Feb. 22, 1908, p. 578.)
- Judson Daland and J. McFarland, "Primary Malignant Endotracheal Tumour," *Journ. of Amer. Med. Assoc.*, Sept. 3, 1904.
- John Rogers and D. Bryson Delavan, "Treatment of Chronic Laryngeal and Tracheal Stenosis," *Trans. Amer. Laryngol. Assoc.*, 1905.
- John Rogers, "Treatment of Chronic Obstruction in the Larynx and Trachea," *Journ. of Amer. Med. Sci.*, Nov., 1905.
- J. W. Gleitsmann, "Subglottic Sarcoma removed Endolaryngeally with Galvano-cautery Snare," *Trans. Amer. Laryngol. Assoc.*, May 28, 1908, and *N.Y. Med. Record*, July 5, 1902.
- Sylvan Rosenheim and Mactier Warfield, "Case of Fibro-Adenoma of the Trachea; with Remarks on Tumours of the Trachea in General," *Amer. Journ. of Med. Sci.*, June, 1904.
- Jeremiah S. Ferguson, "Aberrant Thyroid Tissue, and its Relation to Intratracheal Growths," *N.Y. Med. Journ.*, Aug. 15, 1904, p. 289.
- Papers by James E. Newcomb, Clement F. Theisen, William K. Simpson, and A. Coolidge, jun., "Diseases of the Trachea," *Trans. Amer. Laryngol. Assoc.*, 1906.
- Lewis A. Conner, "Syphilis of the Trachea and Bronchi: An Analysis of 128 Recorded Cases," *Amer. Journ. of Med. Sci.*, cxxvi., July, 1903, p. 57.
- Henrici, "Tumours of the Trachea," *Arch. f. Laryngol.*, Bd. xvii. 1. (Abstract in *Ann. des Mal. de l'Oreille*, xxxii., ii., 1906, No. 11, p. 513.)

CHAPTER XLII

DISEASES OF THE ŒSOPHAGUS

THE diseases of the Œsophagus are described, more or less briefly, in textbooks on general medicine and surgery, but patients with difficulty of swallowing frequently apply to a throat clinic, and lesions of the gullet often cause symptoms in the pharynx and larynx. Besides, since the introduction of Œsophagoscopy, great progress has been made in the study and treatment of the diseases of this viscus, and, as this is chiefly due to laryngologists, no excuse need be made for going into the subject somewhat fully.*

Surgical anatomy. **Length.**—The Œsophagus begins behind the cricoid cartilage, on a level with the 6th cervical vertebra, and terminates in the stomach, opposite the 10th or 11th dorsal vertebra. The length of the Œsophagus itself is 9–10 inches, made up of the following areas:—

1. Cervical portion, from the cricoid cartilage to the manubrium sterni, $1\frac{1}{2}$ –2 inches (4–6 cm.).

2. Thoracic portion, from the top of the sternum to the opening in the diaphragm, 7 inches (16–18 cm.).

3. Abdominal portion, 1 inch (2–3 cm.).

The distance from the incisor teeth to the commencement of the Œsophagus is 5–6 inches (14·9 cm. in males and 13·9 cm. in females); from the teeth to the bifurcation of the trachea it is 9–10 in. (26 cm. in males and 23·9 cm. in females); and from the teeth to the cardiac orifice of the stomach the distance is $14\frac{1}{2}$ –16 in. (39·9 cm. in males and 37·3 cm. in females).

Shape.—The Œsophagus is not a collapsed tube, as generally taught, but an elongated fusiform cavity. The Œsophagoscope shows us that the first 4 cm. and the terminal 2 cm. are the only parts where the walls are in constant apposition, being closed by the sphincter muscles.† (Fig. 266, p. 610.)

Direction.—The upper extremity is opposite the centre of the vertebral column. In the greater part of its course the tube lies a little to the left of the middle line. Opposite the 4th dorsal vertebra (at the back of the arch of the aorta) it curves up to the mid-line of

* J. Guisez, "Traité des Maladies de l'Œsophage." Paris, 1911.

Guisez and Abrand, "De la Physiologie de l'Œsophage," *Ann. des Mal. de l'Oreille*, xxxvi., 1910, No. 7, p. 271.

E. Rehn, "Œsophagus-Chirurgie." Eine klinische und experimentelle Studie über chirurgisches Vorgehen bei thorakalen und abdominalen Speiseröhrengeschwülsten. Jena.

† G. Killian, *Ann. des. Mal. de l'Oreille*, Juillet, 1908.

the spinal column, but then goes to the left again, to pass through the diaphragm on the left side of the 11th dorsal vertebra.

Relations.—In the neck the important relations are the trachea in front and the carotid sheath on each side. The right recurrent laryngeal nerve lies along the side of the œsophagus. The left recurrent laryngeal lies a little more in front of the tube, and so, in œsophagotomy, this nerve is avoided by opening the gullet towards its posterior aspect. In the thorax, the œsophagus at the bifurcation of the trachea lies to the left of the middle line, and hence the left bronchus is the one more commonly affected in malignant growths of the gullet. Lower down, it passes behind the pericardium. Below the level of the 8th dorsal vertebra the right pleura is invaginated between the back of the œsophagus and the vertebral column. On the left side the pleura only comes in contact with the front of the œsophagus. Hence malignant growths and ulcers of the œsophagus more commonly invade the right pleura.

Examination.—Palpation is seldom of service, except in the case of distended diverticula, but is of value in the detection of enlarged glands or of growths invading the gullet from the outside.

Inspection, by means of the œsophagoscope, is described on p. 49. The upper ostium of the œsophagus is a favourite situation for growths and the lodgment of foreign bodies. As the beak of the œsophagoscope might conceal their presence, or even cause injury to the damaged walls, it is sometimes better to inspect this portion by Mosher's open speculum,* or by suspension laryngoscopy (p. 49).

Radiography is not only helpful in the diagnosis of metallic foreign bodies in the œsophagus, but with the assistance of swallowed mouthfuls of bismuth it is possible to detect the site and even the degree of a stenosis.†

Sounding the œsophagus.—The œsophageal bougie should be used with great caution if there is any suspicion of an aneurysm or of ulcerating malignant disease. The Mackenzie pattern, flattened antero-posteriorly, is a useful shape. A moderate size, from No. 8 to No. 12, is safer to begin with than a probe-ended bougie. The instrument is slightly bent 2 inches from its extremity, lubricated with glycerin, and held in the operator's right hand at about half a foot from its extremity, while with his left forefinger he depresses the tongue, and guides the tip of the instrument over the epiglottis. As the bougie passes the cricoid it is a good plan to make the patient bend his head forwards, and at the same time to request him to make an attempt at swallowing. When the passage of the bougie is arrested, it should be grasped on a level

* H. P. Mosher, *Journ. Amer. Med. Assoc.*, xlvii., Nov. 24, 1906, p. 1695.
H. P. Mosher, *Boston Med. and Surg. Journ.*, clviii., Feb. 6, 1908, p. 189.

† Bertrand Dawson, *Lancet*, Oct. 26, 1907, p. 1144.

with the incisor teeth before being withdrawn, so as to measure the depth of the obstruction. When it is uncertain if the obstruction is due to organic or to spasmodic constriction, it is well to pass the bougie under a general anæsthetic.

For the treatment of strictures the probe-ended bougies are useful. The œsophagus is narrowed at its commencement, also opposite the bifurcation of the trachea, and again at its termination, where it is about $\frac{5}{8}$ inch in diameter, so that no bougie should exceed $\frac{1}{2}$ inch in thickness.

Auscultation has fallen into disuse, and is now largely supplanted by the œsophagoscope.

Dysphagia.—The symptoms of disease of the œsophagus will vary to some degree with different affections, but the one which is nearly common to all is dysphagia. As there are many conditions which may give rise to difficulty of swallowing, it may be well to tabulate the possible causes.

In the nose, mouth, or pharynx.—Carious teeth, pyorrhœa alveolaris; inflammation, tumours, syphilis, or other infections of the tonsils, tongue, pharynx, palate, or postnasal space; retro-pharyngeal abscess, cervical caries; post-diphtheritic and glosso-labio-laryngeal paralysis.

In the larynx.—Any acute laryngeal affection—septic laryngitis, œdema, perichondritis; tubercle, syphilis, or malignant disease.

In the neck, outside the œsophagus.—Enlarged glands, thyroid tumours, particularly if malignant; aneurysm of the internal carotid or innominate artery; dislocation of the sternal end of the clavicle.

In the chest, outside the œsophagus.—Aneurysm, intra-thoracic tumours and abscesses (tuberculous, cancerous, etc.).

Affections of the œsophagus.—Congenital defect, functional dysphagia, spasmodic stricture, cicatricial stenosis from caustics, pressure pouches, malignant disease, varicose veins, syphilis, tubercle, foreign bodies.

Essential paralysis of the œsophagus may be due to diphtheria; hæmorrhage, softening, tumour, or sclerosis in the brain; pressure from enlarged lymphatic glands or diseased vertebræ on the vagus nerve; chronic alcoholism or lead poisoning setting up neuritis; and syphilis.*

It is rare for external pressure on the œsophagus, such as that of an aneurysm or a mediastinal growth, to give rise to well-marked obstruction.†

* R. Saundby, *Brit. Med. Journ.*, Jan. 31, 1914, p. 239.

† Osler, "Text-Book of Medicine."

Goodhart, *Lancet*, Nov. 8, 1902, p. 1241.

Charters Symonds, *Proc. Laryngol. Soc., London*, ix., 1902, p. 137.

FUNCTIONAL DYSPHAGIA

Functional dysphagia may be manifested under two forms, a paralytic and a spasmodic. There is either a difficulty in moving the bolus of food from the mouth into the pharynx (the first stage of deglutition), or else the morsel cannot be passed from the pharynx into the gullet (the second stage), and is, as a rule, rejected. Once the food passes the level of the cricoid cartilage its descent to the stomach (the third stage) is not arrested.

Etiology.—Functional dysphagia is generally met with in females between the ages of 19 and 30, but it may occur at any age, and also in men and children. Although rare in old-standing cases of hysteria, it is frequently one of the earliest symptoms of this disease (Weir-Mitchell).

Symptoms.—Before coming under observation, most patients have given up any attempt to swallow solids, and have nourished themselves entirely on liquids. As a rule there is no distaste for solid food; there is no complaint of pain; the patient states that "she cannot get the food out of her mouth," or "that it goes down but comes up again before it is half swallowed"; or that "when she goes to swallow she feels a ball rising in her throat to meet it." Attempts at swallowing solids are often made with exaggerated effort. If the bolus leaves the mouth, it does not pass the second stage of deglutition, and is soon gulped back into the mouth. There may be no loss of weight. If the patient is thin she may be pale but is not cachectic; there are no secondary affections; she may be able to get through a considerable amount of work. A patient with malignant disease loses weight pretty steadily, even if taking more solid nourishment than a sufferer from functional dysphagia does, and soon becomes feeble and cachectic. As Weir-Mitchell puts it, functional dysphagia "one sees often in cases which are afoot."*

Examination.—Careful inspection with a good light and the laryngoscope must first be made to exclude all the possible causes of dysphagia mentioned on p. 596. The neck and chest are then examined, not omitting the use of radiography. When any suspicion of malignant disease or aneurysm has been excluded, the œsophagus should be directly inspected in its whole length, or a full-sized bougie passed down into the stomach.

Diagnosis.—The age and sex of the patient, the history of the case, the duration of the dysphagia, the ability to swallow liquids, and the preservation of a fair amount of strength, will suggest that the disease is functional. Carcinoma is rare before

* "Diseases of the Nervous System," p. 203. Philadelphia, 1881,

the age of 40; it is much more frequent in men than in women; but the diagnosis is made difficult from the fact that when malignant disease does occur in early life, it is chiefly met with in females, and often between the ages of 20 and 30.

Prognosis.—This is good as regards length of days. Some patients remain unaltered for years, continuing to nourish themselves sufficiently on fluids. In some the symptoms are intermittent. In many they recur. Weir-Mitchell writes: "You will be well if you escape this exasperating disorder in your early hysterical cases. It is most enduring and difficult of relief." *

Treatment.—The mental effect of the passage of the bougie acts admirably, but it is important to keep up the influence by suggestion. The patient must have it impressed on her that a full-sized bougie must be passed every week, if there is the slightest return of dysphagia. The mouth and teeth may require attention; many patients are remarkably anæmic, and need prolonged treatment; and the affection is much more common in the sedentary and those who dread fresh air. Ovarian and uterine irritation, as well as gout and rheumatism, may call for treatment. The usual remedies for hysteria may be required, including change, rest, spa treatment, massage, and electricity.†

SPASMODIC STRICTURE

Spasmodic contraction of the mouth of the œsophagus occurs in functional dysphagia (p. 597). But spasm of the gullet may be symptomatic, reflex, or idiopathic.

Etiology.—In children, intestinal irritation (worms) is perhaps the commonest cause of reflex spasm. In adults, any of the neuroses may cause it; poison like rabies, and certain drugs which cause a dryness of the throat, like belladonna, may excite spasm; new growths and aneurysms may stimulate it by reflex irritation, apart from direct pressure. Spasm also occurs with foreign bodies, inflammation, ulceration, or other pathological conditions of the gullet. In old people, spasm may be set up by arterio-sclerosis, especially when the aorta is much affected.

The chief **symptom** is dysphagia; if the lower end or hiatus œsophageus is affected, regurgitation will also occur. **Diagnosis** is founded on the indications suggested for recognizing functional dysphagia and malignant disease of the œsophagus. It is not always easy, but œsophagoscopy will show the existence of violent contraction of the upper end of the œsophagus, and to a lesser degree of the cardiac end. Food is sometimes arrested in the

* *Loc. cit.*

† StClair Thomson, *Lancet*, Dec. 3, 1898.

intrathoracic portion, remaining in a sort of closed cavity between the contracted upper and lower extremities of the œsophagus.* Some deny the possibility of purely functional tonic spasm of the gullet, and assert that in the cases so recorded the condition only masked an organic lesion.† **Prognosis** varies with the cause and nature of the underlying malady. In the idiopathic and reflex varieties the spasm may last a considerable time.

Treatment.—Any source of reflex irritation is first attended to. Antispasmodics—bromides, valerianates, and camphor—may prove useful. The passage of a full-sized bougie is generally beneficial. Electricity, faradic or galvanic, is sometimes ordered, with the positive pole in the œsophagus. The alarm and possible risk caused by such an application are not in its favour, particularly as the results are not better than those to be obtained by persistent general treatment, the influence of suggestion, and lavage and dilatation with olivary bougies conducted under the guidance of the œsophagoscope.‡

CONGENITAL IMPERFORATION OF THE ŒSOPHAGUS

This is generally regarded as a very rare condition, but probably it is more frequent than has been thought, the comparative rarity causing it to be overlooked or the symptoms to be attributed to some other cause. Some 22 cases have been published.§

Symptoms hardly manifest themselves before the second day after birth, and few of the infants have survived for more than four days, though some have lived for six to nine days. Vomiting is the chief symptom, and its occurrence should attract attention if the child is vigorous, if it sucks strongly and eagerly, and if the ingestion of food leads to coughing and choking.

There are two forms of congenital occlusion, one in which the upper and lower parts of the occluded œsophagus are united by a fibrous cord, and the other in which the lower portion opens into the trachea, or one of the bronchi. This latter appears to be the more usual (Fig. 262).

* Guisez, *Journ. des Praticiens*, Mars 4, 1914; and *Brit. Med. Journ. Epitome*, July 25, 1914.

† W. Hill, *Journ. of Laryngol.*, xxvii., 1912, No. 2, p. 80.

‡ Lerche, *Amer. Journ. Med. Sci.*, March, 1912; and *Journ. of Laryngol.*, xxvii., No. 11, p. 629.

§ Gibson, "Anatomy." 1703.

Hirschsprung, 14 cases. (Abstract in *Med.-Chir. Rev.*, 1862.)

William Thomas, *Lancet*, Feb. 6, 1904.

F. J. Steward, *Proc. Laryngol. Soc., London*, x., Dec., 1902, p. 28.

J. E. Spicer and Arthur Keith, *Journ. of Anat. and Phys.*, vol. xli., 1907, p. 52.

J. E. Spicer, *Lancet*, Jan. 19, 1907, p. 157.

Villemin, *Bull. et Mém. de la Soc. de Chir. de Paris*, 1904, No. 25.

H. J. Hott, *Path. Soc. Trans.*, London, 1876.

Other abnormalities of the alimentary tract sometimes coexist. Imperforation appears to be an arrest of development rather than a pathological process in the fœtus.

Treatment.—An effort to save the child's life is best made by the prompt performance of a gastrostomy. Unfortunately



Fig. 262.—Congenital imperforation of the œsophagus.

The trachea has been opened in front, and a slit has been made in the œsophagus so as to show that a probe passed up the gullet would enter the windpipe. The pharynx, into which a glass rod has been passed, ends in a cul-de-sac, and does not communicate with the œsophagus. (*Royal College of Surgeons Museum.*)

this operation generally fails to do good, as milk introduced into the stomach is apt to be discharged upwards into the trachea.

PEPTIC ULCER OF THE ŒSOPHAGUS

This condition was first described by Albers in 1839. Tileston has been able to collect 41 authentic cases of the condition, to which number he adds 3.*

Ewald (1910) describes one case diagnosed by means of the œsophagoscope, and cured. Probably at least 46 have been recorded.

* Tileston, *Amer. Journ. Med. Sci.*, 1906, cxxxii., p. 240.

† Ewald, *Berl. klin. Woch.*, 1910, No. 5, S. 180.

The most typical and constant **symptoms** of the condition are: Pain, which is severe and comes on immediately after food, the site of the pain being at the lower end of the sternum. Pain is also felt between the shoulders. Vomiting is the next most constant symptom. Dysphagia is present in more than half the cases. It is due to reflex spasm of the œsophagus from pain, and it is the main diagnostic point between the condition and gastric ulcer. Hæmatemesis is also a very common symptom. Perforation has occurred in 8 cases—thrice into the right pleural cavity (cf. p. 596), once into the left, once into both (in each case with pneumothorax), once each into the aorta, pericardium, and lesser omental sac.

The ulcer is usually single. It may extend into the stomach, and independent ulcers may occur in the stomach or duodenum. The situation is usually close to the cardiac orifice, and the right postero-lateral wall appears to be the commonest site. The condition is usually found in middle life. As regards sex, of 45 cases in which the sex was specified, 31 were males and 14 females.

Examination and diagnosis are effected by an œsophagoscopic examination.

Treatment is conducted on the same lines as for duodenal ulcer. In addition, thanks to the œsophagoscope, the peptic ulcer of the gullet can be cleansed and treated with nitrate of silver, bismuth, and so forth. Healing not infrequently occurs, as in the case described by Ewald,* and one mentioned by Quincke.†

VARICOSE VEINS OF THE ŒSOPHAGUS

These are chiefly met with in alcoholic subjects and associated with cirrhosis of the liver. Hæmatemesis is the symptom which would direct attention to the condition. It is not uncommonly associated with sacciform dilatation above a spasmodic stricture of the cardiac orifice of the œsophagus, and attacks of vomiting.

FIBROUS STRICTURE OF THE ŒSOPHAGUS

Synonyms.—*Non-malignant stricture; cicatricial stricture.*

Etiology.—This form of stricture may be congenital,‡ or caused by swallowing strong acids or caustic potash, or be left by a simple ulcer, traumatism, or syphilis. It is suggested that a form of stricture may exist in the œsophagus which is neither spasmodic, cicatricial, nor malignant, which has been termed simple stenosis

* Ewald, *Zeits. f. klin. Med.*, 1892, xx., S. 524.

† Quincke, *Deutsch. Arch. f. klin. Med.*, 1879, xxiv., S. 72.

Harold H. B. Macleod, *Brit. Med. Journ.*, Jan, 20, 1912, p. 115.

‡ Bertram H. Rogers, Society for the Study of Disease in Children, June 18, 1904.

or membranous stricture, but which might perhaps, with greater reason, be called idiopathic (Kendal Franks).*

It is less frequently met with than malignant stricture.

The **symptoms** are those of dysphagia. The diagnosis is made by the use of the bougie, radiography, and the œsophagoscope. Strictures produced by scalds or caustics are said by some observers to be always found in the two narrowest portions of the gullet, near the ostium or the cardiac orifice. Others find the cicatrix is at neither end, but in the open part of the tube. Long tracts of the gullet may be closed by cicatrization.

Treatment is not very satisfactory in these cases, owing to the tendency of scar tissue to contract. After swallowing acids the passage of bougies should be commenced within a few weeks. Their use may have to be continued through life. Continuous dilatation with a drainage-tube or Symonds' tube is more rapid.

Dilatation through the œsophagoscope may be tried if the stricture is simply annular. Gastrostomy is required in many cases, both to nourish the patient and to allow of the stricture being dilated from below or from above.

Fibrolysin has been recommended in hypodermic doses of one ampulla (2·3 c.c. = MXXXVII) two or three times a week.

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Guisez, "Rétrécissements cicatriciels infranchissables de l'Œsophage et Œsophagoscopie," *Ann. des Mal. de l'Oreille*, xxxv., 1909, No. 9, p. 315.

DILATATION OF THE ŒSOPHAGUS

When the œsophagus is narrowed it is usual for dilatation to occur above the stricture, although most of the food which will not pass is soon rejected. But a diffuse dilatation is sometimes met with associated with spasm of the cardiac end, and other causes (primary atony, or paresis from general or local neurosis) may account for it.† The dilatation generally begins just below the cricoid cartilage, becomes fusiform about 5 inches from the upper end, and then diminishes to the normal diameter about 3 inches above the diaphragm. This fusiform tube may be 14 inches long, 3 inches across (i.e. a circumference of 6 inches), and have a capacity of 20 oz.‡

Primary or idiopathic dilatation may attain considerable

* *Brit. Med. Journ.*, Nov. 3, 1894, p. 973. (Gives references to 10 cases.)

† A. Brown Kelly, *Journ. of Laryngol.*, xxvii., 1912, No. 12, p. 658; and *Brit. Med. Journ.*, Oct. 19, 1912.

‡ T. Wardrop Griffith, *Med. Chron.*, Nov., 1898, p. 113.

John Knott, *Med. Press*, Feb. 7, 14, 28, and Mar. 14, 1900.
Peverell S. Hichens, *Brit. Med. Journ.*, Feb. 17, 1912, p. 360.

dimensions. It generally involves the whole length of the œsophagus, which assumes a cylindrical, fusiform, or bottle shape.

Dysphagia is the chief **symptom**, with burning pain, indigestion, and various distressing symptoms on swallowing, often culminating in copious œsophageal regurgitation. Still, the general health may remain tolerably good for many years. **Diagnosis** is based on the chronicity of the affection and the use of the sound, radioscopy, and œsophagoscopy.

Treatment begins by prescribing a suitable dietary, combating spasm, and dilating the cardiac orifice. The dilated œsophagus may be washed out with simple water, or with a solution of nitrate of silver (1-3 per 1,000), or borax (2 per cent.). Œsophagoscopy permits of certain manœuvres which, if undertaken in the dark, would be dangerous. It enables us to pass soft, olivary bougies or dilating bags. Lastly, if these measures fail, and the patient is threatened with inanition, gastrostomy may be required.

RUPTURE OF THE HEALTHY ŒSOPHAGUS

This accident is not quite so rare as is commonly considered. About 25 cases have been recorded.* Rupture of the œsophagus may result from external traumatism, or from violent vomiting, generally after a full meal. It is predisposed to by any local ulcer, or weakness of the walls of the tube consequent on severe constitutional disease. It is more common in men in the prime of life, and in the alcoholic.

The **symptoms** are sudden and intense local pain, very hurried and laboured respiration, cyanosis, quick pulse, thirst, and collapse. Vomiting occurs in the majority of cases, but ceases when it has done its mischief. Agonizing pain follows any attempt at swallowing the stimulant which so frequently appears called for in these cases. The signs of pneumo-hydrothorax generally develop, nearly always on the left side. Emphysema may occur, appearing first at the root of the neck. Cough is not constant, but when present is very painful. Deglutition is not particularly disturbed.

A correct **diagnosis** is seldom made during life, and cases are apt to be mistaken for perforation of a gastric or duodenal ulcer, rupture of an aneurysm, angina pectoris, colic, or irritant poisoning.

Prognosis.—Death generally occurs within twenty-four hours. If the condition is suspected, anxiety will not be relieved until forty-eight hours have passed.

The rent in the œsophagus is generally in the lower third of

* G. R. Turner, *Lancet*, Aug. 4, 1900, p. 350.

the tube, in its long axis, and on the posterior wall. It usually opens into the left pleural cavity.

Treatment is symptomatic: relief of pain; discontinuance of all nourishment by the mouth; rectal injections. Surgical treatment, by posterior thoracotomy, does not hold out much promise of cure, particularly as the rent generally occurs in the lower third of the tube, and the difficulties and dangers of exploring the œsophagus below the 9th dorsal vertebra are well known.

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 Howard E. Lomax, *N.Y. Med. Record*, lxix., Jan. 6, 1906, p. 1. (Gives several references.)
 P. L. Gunckel, *Amer. Med.*, x., 1905, No. 18, p. 726.
 T. H. Potter, *ibid.*, Sept., 1906, p. 340.

ACUTE ŒSOPHAGITIS

Acute catarrhal inflammation of the gullet is rarely met with. Phlegmonous inflammation is a severe affection, but is also very rare.

Traumatic œsophagitis may be due to swallowing very hot fluids, or corrosives such as acids and alkalis. The drinking of neat spirit may cause a membranous cast of the œsophagus.* It is most commonly produced by the impaction of foreign bodies, or wounds in the gullet caused in attempts to remove them. Softening of the walls of the œsophagus occurs with alarming rapidity. The gullet, indeed, offers but feeble resistance to the effects of traumatic inflammation. This is possibly due to the fact that the canal is not intended by nature for the long sojourn of food; by watching a swan feeding we can see that a bolus of food glides along the whole length of the neck in a few seconds.

The **symptoms** are intense pain, dysphagia, thirst, collapse, and cervical cellulitis. Anxiety is a frequent symptom, but is said to be absent when the patient believes that any obstructing mass has been completely swallowed.

Treatment consists in counteracting an acid with a dilute alkaline solution, or a caustic alkali with dilute vinegar or oil. The treatment of a foreign body is given at p. 749.

Corrosive liquids produce a slough of greater or less extent, and of a different colour according to the liquid swallowed. Thus, with sulphuric acid it is brown, with nitric acid it is yellow or orange, while hydrochloric causes a grey or leaden slough, and oxalic acid (salts of lemon) one which is white or creamy.

* Nathan Raw, *Lancet*, 1901, i., Jan. 5, p. 26.



Fig. 1.—Postero-anterior view.



Fig. 2.—Lateral view.

Pressure pouch of the cesophagus.

Two radiograms showing arrest of bismuth
in œsophageal pouch. (*Ironsides Bruce, in
Choyce's "System of Surgery."*)

PLATE XX.

PRESSURE POUCHES

Synonymy. — *Œsophageal diverticula*; *pharyngo-œsophageal pouches*; *pharyngoceles*; *retrocricoid diverticula of the pharynx*.

This condition is not so rare as we have been led to suppose;

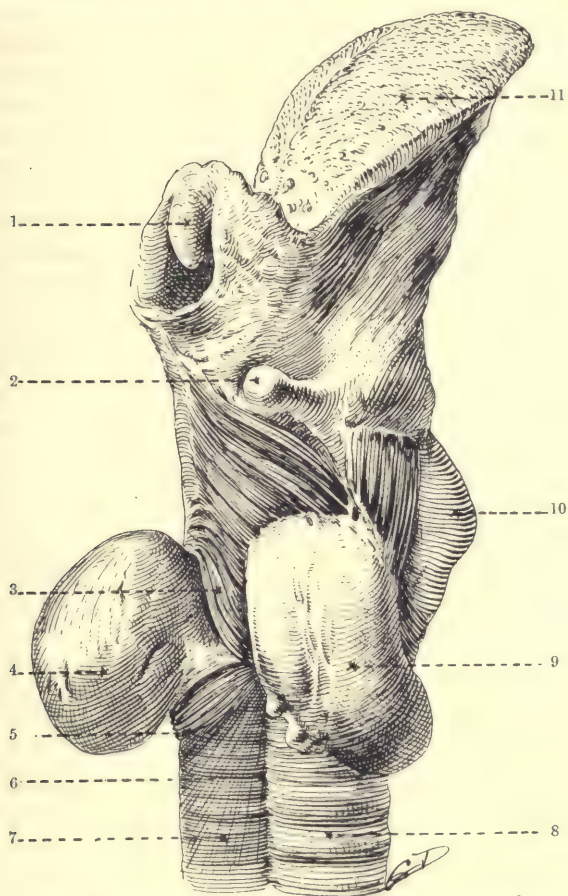


Fig. 263.—Pharyngeal diverticulum, or pressure pouch of the œsophagus.

1, Uvula; 2, greater cornu of the hyoid bone; 3, pars obliqua of the inferior constrictor of the pharynx (crico-pharyngeal muscle); 4, pharyngeal pouch; 5, pars fundiformis of the inferior constrictor; 6, levator œsophagi muscle; 7, œsophagus; 8, trachea; 9, thyroid gland; 10, thyroid cartilage; 11, tongue. (*G. Killian.*)

about 100 cases were reported in 1905, and many have been published since.

Œsophagoscopy has been able to demonstrate that the pouch

always originates in exactly the same place, namely, in the hypopharynx, in the middle line, on the posterior wall, and exactly opposite the cricoid. The pouch is really situated above the orifice of the œsophagus. The sac is composed of the mucous and sub-

mucous coats of the pharynx. As the posterior pharyngeal wall passes imperceptibly into it, any instrument tends to glide into the pouch instead of passing down the gullet (Fig. 263).



Fig. 264.—Œsophageal pouch, or pharyngeal diverticulum.

A study of the mechanism of swallowing shows that the upper part of the inferior constrictor acts as a force-pump, and the lower part as a sphincter. The mucous membrane becomes invaginated between the two parts, and so forms a diverticulum. The arrow indicates the site and direction which would be taken by a pouch. A, sphincteric part of the inferior constrictor; B, D, propelling part of the inferior constrictor; C, E, vertical, deep fibres derived from the middle constrictor, stylo-pharyngeus and palato-pharyngeus. (After Keith.)

Etiology.—The pouch opens into the gullet by a transverse opening in the middle line, about an inch in length. The orifice varies in size in different cases, and may be merely a slit. The pouch makes itself a passage between the pars obliqua and the pars fundiformis of the crico-pharyngeal muscle (the inferior constrictor), immediately above the mouth of the œsophagus.* There are two hypotheses as to the origin of these sacs. The first, that they are due to embryological defects, is only a vague conjecture. The second, that the cause is mechanical, is now generally accepted. If there is any spasm of the mouth of the œsophagus, the bolus of food on arriving there will tend to be arrested and cause dilatation of the hypopharynx. But the unresisting cartilages in front, and the lobes of the thyroid

gland on each side, will prevent dilatation of these walls. Although supported by the vertebral column, the posterior wall is, therefore, the one which is apt to yield, and the muscular wall has its weakest

* G. Killian, *Ann. des Mal. de l'Oreille*, xxxiv., ii., Juillet, 1908, p. 1.

spot at the point indicated (Fig. 264). Incomplete mastication may be a predisposing cause. Although not unknown as early in life as the twenty-third year (Killian), most cases occur in elderly subjects with defective dentition who bolt their food. It is more frequent in males, and may occur in patients over 70 years of age.

Symptoms.—Return of fragments of undigested food is the one constant symptom in every case—not immediately after the food has been taken, but many hours, or even days, afterwards. Solids are more troublesome to swallow than liquids; there is no dysphagia, but the patient has to make two efforts before deglutition is accomplished. There is no vomiting or pain, but the patient may notice a gurgling noise in the throat, especially when lying down and at meals; this is followed by the bringing up of quantities of phlegm.

Examination.—Fullness may be noticed in the lower part of the posterior triangle of the neck (generally on the left side). Pressure over this produces a gurgling noise, and escape of gas by the mouth, followed by liquids or particles of food. A bougie is arrested at a distance of 6–7 inches (17 cm.) from the upper teeth. If the bougie be made of metal and slightly curved, its end may be felt and noticed in the side of the neck (almost always on the left side) behind the sterno-mastoid muscle. The pouch may also be filled with bismuth so as to demonstrate it by radiography. It is still more satisfactory to examine it by œsophagoscopy. (Plate xx., facing p. 604.)

Diagnosis.—The affection is frequently mistaken for a stricture, but there is no loss of weight, as a rule.

Prognosis.—When patients are much inconvenienced by the pouch, live in dread of malignant disease supervening, or are losing weight, they should be advised to submit to operation. Men over 70 years of age have been successfully operated on.

Treatment.—By emptying the pouch from the outside, after every meal, some patients remain fairly comfortable. Otherwise it can be removed by an operation through the side of the neck. The operation is not free from difficulty, and is not unattended

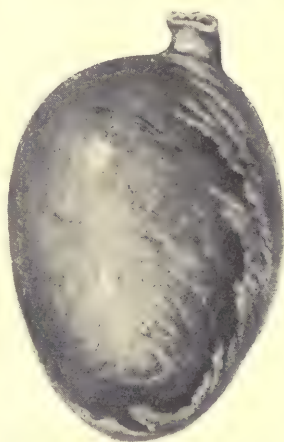


Fig. 265. — Pressure pouch of the œsophagus, or pharyngeal diverticulum.

Life-size drawing of a Kayserling preparation. (Paul Albrecht.).

with risk.* A long incision is made on the anterior border of the sterno-mastoid, with its centre opposite the cricoid cartilage. The dissection is carried down to the inner side of the great vessels, and outside the trachea. The omo-hyoid muscle and the superior thyroid vessels must be divided. After removal of the pouch, the wound in the gullet is carefully closed with silk sutures, and a drainage tube is placed in the external incision.† (Fig. 265.)

Traction diverticula occur in the course of the œsophagus itself, generally on the anterior wall behind the bifurcation of the trachea. They vary in size; the smallest may hold a pea, the larger will admit the point of the little finger. They are never more than an inch deep, and give rise to no symptoms unless complications arise by suppuration and ulceration into the superior vena cava, pulmonary artery, aorta, or trachea. If distended with food they may give rise to symptoms resembling those of a pressure pouch. A bougie may be arrested at 16-17 inches from the teeth.‡

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CANCER OF THE ŒSOPHAGUS

Synonym.—*Malignant stricture of the œsophagus.*

Although cancer of the œsophagus is described at length in general textbooks of medicine and surgery, little excuse need be

* Stetten, *Ann. of Surg.*, li., 1910, pp. 300-19. (Operation mortality of over 15 per cent. in 60 collected cases.)

† Friedrich Neumann, "Die Operation des Œsophagusdivertikels," *Arch. f. Laryngol.*, Bd. xxviii., 1913, Heft 1, S. 12.

‡ W. Zweig, *Deut. med. Woch.*, Aug. 15, 1901. (Epitome in *Brit. Med. Journ.*, Oct. 5, 1901.)

A. Reitzenstein, *Münch. med. Woch.*, 1898, No. 12, S. 355.

given for referring to the subject in these pages. Not infrequently a patient with this disease may only complain of such symptoms as hoarseness, aphonia, shortness of breath, cough, expectoration, or hæmoptysis, and the diagnosis may first be made from the reflection in the laryngologist's mirror, and confirmed by him from direct inspection with the œsophagoscope.

Etiology.—The majority of cases occur in males who are past middle age. When the disease occurs in females it is not uncommon as early as the twenty-third year,* and with them it attacks the hypopharynx more frequently than it does in men.

Pathology.—Carcinoma is the usual type. Of 100 instances, it is situated in the upper part of the tube in 10, in the middle in 33, and in the lower part in 57.† According to some statistics it occurs with equal frequency in the upper and lower half of the œsophagus, while other figures show 52 per cent. of cases in the upper part of the œsophagus and only 8 per cent. in the lower.‡ Sarcoma may also occur.§

Symptoms.—The commonest symptom is gradually increasing dysphagia—always of ominous importance in an elderly subject. In no inconsiderable number of cases the onset is sudden. There may be pain—particularly when the central portion of the gullet is affected—and distaste for food. Attempts at swallowing are made with anxiety, but with evident goodwill, and often result in coughing and regurgitation of food or drink. Loss of weight is generally steadily progressive, and more rapid than the amount of nourishment ingested would lead one to suspect. But œsophageal obstruction may be a late symptom, or even be entirely absent throughout the course of the disease. In such cases the symptoms may be (1) dyspepsia, epigastric pain, vomiting and flatulence; (2) shortness of breath, cough, and expectoration; (3) loss of voice, stridor, and cough produced by the passage of food; (4) hæmoptysis; (5) aphonia; or only (6) a tender lump in the neck.||

The disease usually progresses by inanition and cachexia, but complications arise if the cancer invades neighbouring organs. Thus "cough immediately after swallowing" may signify a communication between the œsophagus and the trachea, or a bronchus (generally the left), or the lung itself, and be the precursor of septic

* W. R. H. Stewart, *Proc. Laryngol. Soc., London*, iii., 1895, p. 20.

† E. Schütz, *Centralbl. f. die gesammte Therap.*, May, 1904. (Epitome in *Brit. Med. Journ.*, Oct. 15, 1904.)

‡ A. Logan Turner, *Journ. of Laryngol.*, xxviii., 1913, No. 6, p. 281.

§ Edred M. Corner and H. A. T. Fairbank, *Practitioner*, xxii., 1904, p. 819. (Collection of 14 cases.)

|| G. H. Emanuel, "Cancer of the Œsophagus without Obstruction," *Lancet*, Oct. 18, 1902.

bronchitis or broncho-pneumonia. The bringing up of blood may be an initial symptom, and, in a later stage, hæmorrhage may be the cause of death.

Examination.—A laryngoscopic examination will sometimes show that a laryngeal paralysis (unilateral or bilateral abductor palsy) is an early symptom, caused by the growth pressing on the recurrent laryngeal nerve, or by actual destruction of the posterior crico-thyroid muscle (*see* p. 556, and Figs. 256, 257, p. 559). The left cord is, perhaps, more frequently and more completely paralysed, but both cords may be affected. Œdema of the arytenoids and neighbouring parts of the pharynx may be caused by a growth in the upper part of the gullet.

Occasionally a large, hard mass of glands in the neck will precede



Fig. 266.—The normal cardiac orifice, as viewed by the œsophagoscope. (*Guisez.**)

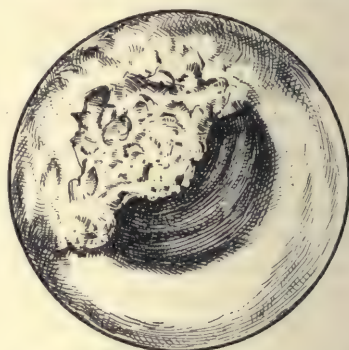


Fig. 267.—Ulcerating cancer of the œsophagus, as viewed by the œsophagoscope. (*Guisez.*)

any definite symptoms of stricture, particularly when the upper part of the œsophagus is affected. These glands may be so large as to produce immobility of the larynx on the same side, and, by involving the cervical sympathetic, cause narrowing of the palpebral fissure, contraction of the pupil, and absence of sweating on the corresponding side of the head and face.†

Œsophagoscopy, when it is available, enables a diagnosis to be made promptly. It is the method of choice, and it not only permits inspection of the growth (Fig. 267), but in many instances allows of a portion being removed for microscopic examination (*cf.* p. 49). Failing the direct method, the œsophageal bougie can be gently used to locate a stricture (*cf.* p. 595). It will some-

* *Journ. of Laryngol.*, xxiii., Sept., 1908, p. 459.

† H. T. Butlin, *Proc. Laryngol. Soc., London*, ii., 1895, p. 79.

H. T. Butlin, *St. Bartholomew's Hosp. Repts.*, xxix., 1893, p. 103.

times pass more easily after a night's rest, and a dose of opium ; or the pharynx may be sprayed with 5 per cent. cocaine, and the sinus pyriformis painted with a 20 per cent. solution. The *bougie coudé* will sometimes detect a stricture when the ordinary conical one will fail. As there is a possibility of entering the larynx, the patient should be asked to breathe freely to test this. The distance from the teeth to the growth varies in different cases from 18-45 cm. (7-17 inches). With the diffusion of our modern methods of examination this use of the bougie will soon be abandoned ; and in the meantime it is well to remember that " many patients have been killed by forcing a bougie through the carcinomatous œsophageal wall " (H. P. Mosher).*

Diagnosis.—In early stages, and throughout the disease in some cases, diagnosis is not easy, particularly when dysphagia is not complained of. On the other hand, dysphagia may be due to malignant disease in the abdomen, or defective teeth, or some other cause (cf. p. 596). Early symptoms are often mistaken for those of dyspepsia, gastric ulcer, or gouty œsophagitis. The growth may project into the trachea, and the earliest symptoms may then be stridor and hæmoptysis. A patient may die of pyo-pneumothorax, from a cancer perforating the pleura, without its true nature or its origin in the œsophagus having been even suspected. Astley Cooper observed that when a patient obviously has a cancer somewhere, it is only in the œsophagus that it may cause no symptoms. It is met with more frequently than simple stricture.† Organic obstruction in the upper third of the gullet is said to be always malignant (Symonds).

Prognosis.—This is always serious. When symptoms are declared, the average duration of life is from a few months to a year or a year and a half, death resulting from exhaustion, septic absorption, inanition, or pulmonary or other complications.

Treatment.—Treatment can only be alleviative. Food should be bland and non-irritating ; but the patient is soon reduced to liquids, which should be as varied and nourishing as possible. Mixtures of bismuth and hydrocyanic acid sometimes soothe the local irritation and spasm. The swallowing of olive oil ; the hypodermic injection of morphia and atropine half an hour before meals ; and hourly sips of a 1 per cent. solution of peroxide of hydrogen, will sometimes prolong the time that the patient is able to obtain sufficient nourishment by the mouth.‡ Rectal feeding may help in emergencies, as a temporary measure.

* *Trans. Amer. Laryngol., Rhinol., and Otol. Soc.*, 1914.

† T. N. Kelynack and W. B. Anderton, *Med. Chron.*, Nov., 1898, p. 106.

‡ Liebermeister, *Munch. med. Woch.*, 1911, No. 38, and *Ann. des Mal. de l'Oreille*, xxxviii., 1912, No. 12, p. 660.

The daily passage of a sound, though attended with risk of perforation, is said to give as good a prospect of life as gastrostomy.*

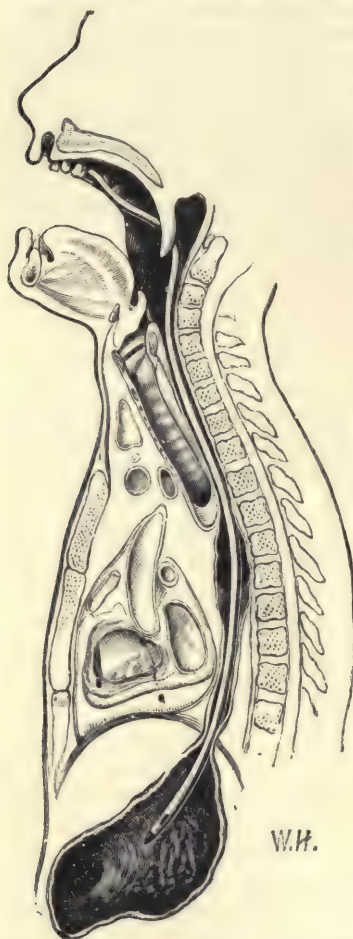


Fig. 268.—Hill's oro-œsophago-gastric intubation apparatus for stricture of the gullet. (Shown in situ.)

The method of fitting a funnel in the stricture is thus described by Charters Symonds:†—"First ascertain by a large bougie the exact position of the stricture, i.e. the number of inches from the teeth; then pass the largest conical bougie possible, and judge by this the size of the tube to be used. Fitting now the introducer (made of whalebone and enclosed by a gum-elastic sheath), mark on it the distance of the stricture, or make a knot in the silk (the cords which are attached to the upper dilated part of the tube), and insert with the head thrown back. When it has entered the stricture, send the tube down slowly till arrested by the funnel, and withdraw the introducer. The silk is now tied round the ear, and fixed behind by a piece of strapping." A better plan is that of W. Hill, who fits a malleable silver stilette inside a soft rubber catheter. This gives sufficient rigidity to the instrument to guide it through a stricture—under the control of the œsophagoscope. The upper end is fixed to a lower molar tooth, or secured to the ear.

Not only can abundant fluid nourishment be poured down inside the catheter, but the instrument relaxes spasm and exerts sufficient pressure on the growth in many cases to allow of food being swallowed alongside it. This apparatus can be worn in

* E. Schütz, *loc. cit.*

† *Clin. Soc. Trans.*, xviii., 1884; *Brit. Med. Journ.*, April, 1887; *Lancet*, March and April, 1889.

the gullet continuously for months at a time without being changed* (Figs. 268 and 269). The tube is not always well borne in cancer of the upper end of the œsophagus, and there is a risk in forcing it through the phreno-cardiac portion. When either of these regions is affected the best method of relief is the early performance of a gastrostomy.

Gastrostomy is frequently required, and should be done before a patient becomes too wasted and cachectic, particularly when the lower end of the œsophagus is affected.

Relief, if not cure, may be hoped for from applications of radium.†

A tracheotomy may be required if respiration is interfered with, and other complications must be treated as they arise.

Foreign bodies in the œsophagus are described in Chap. LIII., p. 742.

Tubercle of the œsophagus.—See Chap. XLIV., p. 654.

Syphilis, although so commonly met with in the pharynx, is rarely encountered as a cause of œsophageal stricture. Thus W. Hill only observed one case—and it was at the junction of the œsophageal ostium and the pharynx—in 180 endoscopic examinations of the gullet, and Guisez had only seen one syphilitic stricture in over 800 cases.‡

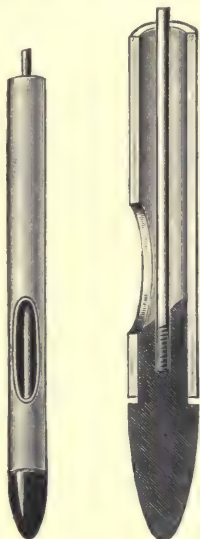


Fig. 269.—Distal extremity of Hill's oro-œsophago-gastric intubation apparatus.

Shows flexible silver stilette screwed into vulcanite nose-piece, and orifice in rubber tubing for passage of fluids.

* Irwin Moore, *Proc. Roy. Soc. Med.*, Laryngol. Section, viii., Nov., 1914, p. 8.

† W. Hill, *ibid.*, iv., Nov., 1910.

J. Guisez, *Proc. XVIIth Internat. Cong. Med.*, London, 1913, Section xv., Part ii., p. 75.

‡ *Journ. of Laryngol.*, xxviii., 1913, No. 1, p. 35.

PART VIII.—CHRONIC INFECTIVE DISEASES

CHAPTER XLIII

TUBERCULOSIS OF THE UPPER AIR-PASSAGES

(LUPUS ; TUBERCULOSIS)

TUBERCLE bacilli usually attack the body either through the respiratory tract or the alimentary canal. It seems well founded that in adults the former is the most usual route, and it would appear that it is the more common of the two channels in children (cf. p. 6). But, in the majority of instances, the defensive mechanisms of the nose and throat prevent the invading organism from securing a local foothold. Tubercle bacilli have certainly been found in the nostrils of healthy individuals, and this suggests that they must often be arrested at the very threshold;* for, in the nose itself, their inoculation only leads to the manifestation of disease in its most mitigated form, viz. that of lupus. The rapidly progressive tuberculosis we so often meet with in the larynx is practically unknown in the nasal cavities.† In the pharynx we find both the attenuated form of the disease (i.e. lupus) and the acute miliary. In the larynx active tuberculosis is much more common than the chronic form. The lungs are still more frequently the seat of progressive tuberculosis. In other words, the defences of the nose are so complete that acute tuberculosis hardly ever occurs there, and the lower down the infection of the air-tract the more virulent is the process.

Attention has already been called to Waldeyer's ring of lymphoid tissue, which guards the upper air- and food-passages (p. 9). A latent tuberculosis of this region can no longer be looked upon as rare. By tabulating the results of some 20 observers I have calculated that, on a rough average, some 5 to 6 per cent. of adenoid growths show histological evidence of tubercle.‡ Similar results have been arrived

* Strauss, *Arch. de Méd. expér. et d'Anat.*, Juillet, 1891.

Strauss, *Bull. de l'Acad. de Méd.*, v. 32, No. 27.

N. W. Jones, *Med. Record*, Aug. 23, 1900.

† Henri Caboché, *Ann. des Mal. de l'Oreille*, xxxiii., 2, 1907, No. 10, pp. 321-428

‡ *Practitioner*, July, 1901, p. 80.

at in regard to the palatine tonsils.* The lingual tonsils are least frequently infected.† In none of these instances were there clinical evidences of tuberculosis. In patients dying of phthisis the palatine tonsil may be found tuberculous in 20 out of 34 cases.‡ (See, further, latent tuberculosis of tonsils and cervical glands, p. 382.)

These observations confirm the importance, already pointed out, of the defensive mechanisms in the nose and throat. They also support the view that in local resistance, as well as in general immunity, is to be sought the explanation of the incidence of disease.§ The suggestion that lupus is caused by inhaling an attenuated form of the tubercle bacillus is not feasible. It is unthinkable that the nose could escape the inhalation of virulent bacilli, and the fact that lupus of the air-passages is frequently followed by tuberculosis in the lungs or elsewhere proves that the bacillus has only to change its habitat for it to produce a severe clinical manifestation.

Pathology.—It is unnecessary to describe in detail the histological and bacteriological characters of tubercle in the nose and throat. They are identical with those met elsewhere, and are fully described in works on general medicine and surgery. The microscope reveals epithelioid cells, giant cells, and caseation. None of the three, however, belongs exclusively to tubercle. The presence of tubercle bacilli is undoubtedly characteristic. In free secretion, as in sputum, they can be found with ease. Unfortunately, bacilli occur scantily in tubercular deposits, and in lupus are only found with much difficulty. It is this scarcity of tubercle bacilli which minimizes the value of animal-inoculation tests.

Clinically, tuberculosis shows itself in the form of (1) infiltration, (2) ulceration, (3) tumour formation, (4) acute miliary infection, and, in healing areas, by (5) sclerosis. Infiltration may be absorbed, or become fibrosed, without coming to the surface. Tumours are but an exaggerated form of infiltration. Ulceration and sclerosis are the natural efforts at repair, and one, or other, or both methods are to be promoted or imitated. Secondary pyogenic infections may occur in tubercular ulcerations.

Lupus and tuberculosis.—It has been proposed by Massei to do away with the distinction between tuberculosis and lupus, as they are pathologically identical.|| All will agree with him that "lupus of the nose is a tuberculosis of slow progress, and often primary,"¶ but the clinical manifestations are so different that the practical value of maintaining the present classification is obvious. At the same time, just as there are acute and chronic forms of tuberculosis, so a case of lupus may be more or less chronic, while cases are met with intermediate in degree between the two fairly marked types of tuberculosis and lupus. They might be called "lupoid" forms.

* A. Latham, *Lancet*, Dec. 11, 1900.

† P. Tilli, *Boll. delle Malattie dell' Orecchio*, xxv., 1907, No. 9, p. 189.

‡ Hugh Walsham, *Lancet*, June 18, 1898.

§ W. Watson Cheyne, *ibid.*, June 27, 1908.

|| *Proc. Laryngol. Soc., London*, vi., 1898, p. 1.

¶ *Rev. Heb'd. de Laryngol.*, xxv., 1905, No. 10, p. 273.

LUPUS

Etiology and incidence.—Lupus is met with most frequently between the ages of 15 and 30. It is not uncommon in children, but it occurs more rarely at the two extremes of life. It is twice as common in females as in males. This proportion is undoubtedly true as regards the nose and the larynx, but some statistics tend to show that pharyngeal manifestations are comparatively more common in male patients affected with lupus of the skin.* Lupus is much more frequently found in hospital patients—among feeble, anæmic, and ill-nourished females—than in private practice. There may be a previous record of other chronic tubercular troubles or a family history of tubercle.

It occurs most often in the nose, the pharynx comes next in order of frequency, and the larynx last. The most common situation in the nose being that area of the septum where traumatic ulceration takes place (p. 112), it is probable that the patient's own finger nail serves to carry the infection, or to inoculate it. Lupus seldom appears in the naso-pharynx except as secondary to a nasal manifestation. Indeed Escat holds that lupus never occurs in the pharynx or larynx without evidence of its having first invaded the nose. He claims that it is always a descending lesion. This requires confirmation.†

The relation to lupus of the face is interesting. Of the patients seen at the Finsen Institute in Copenhagen, 75 per cent. showed lupus of the mucous membranes. It was entirely limited to the mucosæ in only 1 per cent. of the patients attending there. In the majority of cases the disease seemed to have commenced in the nose.‡ Some observers hold that lupus of the face is always secondary to nasal infection. Indeed, good evidence is produced by Dresch to prove not only that lupus on the face, but also in the conjunctivæ, mouth, pharynx or larynx, is always secondary to lupus of the pituitary membrane.§ But, according to Holger Mygind, 64·5 per cent. of the lupus patients under Finsen's care presented evidence of the disease in the nasal cavities, and in every case it appeared to be secondary to a lesion of the skin of the face. Anyhow, while the importance of the nasal mucosa as the seat of the primary infection in lupus of the skin has been overlooked by some dermatologists, it has been perhaps exaggerated by a few rhinologists, for it is certain that not every case of facial lupus has originated in the nasal mucosa. Thus Albanus

* Holger Mygind, *Arch. f. Laryngol.*, Bd. xvii., Heft 3.

† *Ann. des Mal. de l'Oreille*, xxxi. 1905, No. 10, p. 314.

‡ H. B. Christiansen, *Journ. of Laryngol.*, xviii., 1903, No. 9, p. 507.

§ Jacques Dresch, "Origine Endonasale du Lupus." Paris, 1910.

found the nasal mucous membrane only involved in 46 per cent. of cases of lupus of the skin, and quotes Bender as finding it involved in 33 per cent.* This difference of opinion is probably only apparent, as future observations may show that the disease has its actual starting-point in the area where the skin lining the vestibule of the nose joins the mucous membrane of the nasal cavity proper.† Early deposits in this region cause but trifling symptoms, and patients seldom apply for relief until the skin of the face is invaded. Early diagnosis of nasal lupus is, therefore, of great importance, not only to avoid infection of the skin of the

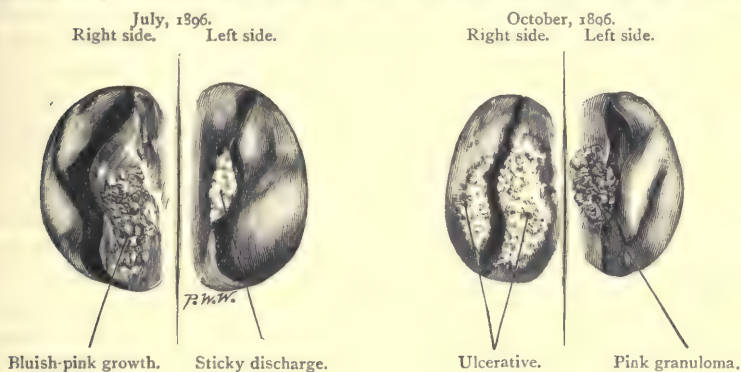


Fig. 270.—Lupus of nose.

Semi-diagrammatic transverse section of nose. There is a bluish-pink, irregular growth on the right side of the cartilaginous septum. The possibility of the cartilage being already involved is indicated by the sticky discharge on the left side.

Fig. 271.—Lupus of nose.

From the same case as Fig. 270, but three months later. The growth has infected the right inferior turbinal and has traversed the septum, producing a perforation, and appearing as a granuloma in the left nostril. This patient has been under my observation for twenty years. Lupus has slowly extended to the naso-pharynx and appeared on the face. Latterly she has developed tuberculosis of the lungs.

face, but also to anticipate the pulmonary tuberculosis which is apt to ensue in certain instances.‡ The patient with lupus is apt to become phthisical, but the patient with pulmonary tuberculosis does not tend to develop lupus; if he develops mischief in the nose or throat it is, clinically, tuberculous.

LUPUS IN THE NOSE

The disease generally attacks the cartilaginous septum (Figs. 270, 271) close behind the vestibule, as well as the adjoining floor of the nose and the anterior part of the inferior turbinal. It may

* Albanus, *Arch. f. Laryngol.*, Bd. xxvii., Heft 2; and *Journ. of Laryngol.*, xxviii., 1913, No. 12, p. 669.

† Holger Mygind, *Arch. f. Laryngol.*, Bd. xvii., Heft 3; *ibid.*, Bd. xiii., Heft 3; *ibid.*, Bd. x., Heft 1.

‡ StClair Thomson, *Proc. Laryngol. Soc., London*, iv., Feb., 1897, p. 34.

spread to the middle turbinal, or to the skin of the vestibule. On the septum it is seen in the form of minute, discrete, apple-jelly-like nodules. As they appear on a pink background it is much more difficult for the untrained eye to detect them there than it is on the skin of the face. In the latter region there is also the help obtainable by pressing on them with a glass slide. As this renders only the adjoining skin bloodless and pale, the lupus nodules are made more evident by contrast. But a similar result can be obtained by applying a little adrenalin and cocaine to the mucous membrane of the septum. The healthy mucous membrane is then blanched while the nodules remain pinkish, and so stand out more clearly.* Sometimes the disease begins in the form of a sessile tumour, varying in size from a small pea to a hazel-nut. This appears† at the usual point on the septum, slowly breaks down, and leads to perforation. This lupus tumour of the septum may resemble a small raspberry, and contain numerous tubercle bacilli.‡ Perforation may also result from the confluence of lupus nodules. The hole made by lupus in the septum is irregular, surrounded with pale, indolent infiltration, secretes little, and increases slowly. It does not invade the bony septum. Nodules involving the inferior turbinal may persist for years without breaking down (Holger Mygind), or the deposits on the floor of the nose and the inferior turbinal may spread slowly, ulcerate and coalesce. The surface is coated with a sticky secretion which dries into adhering scabs. These, if retained, give rise to a sickly odour, but it is not so penetrating as that from ozaena or syphilis. The separation of crusts may cause slight epistaxis. There is no falling-in of the bridge of the nose, but when the vestibules and columella are affected the ulceration is followed by scarring and retraction, so that the tip of the nose is drawn inwards and downwards towards the upper lip, and the nostrils may become stenosed or completely occluded. The disease may spread along the lachrymal duct, causing dacryocystitis and appearing on the skin at the inner canthus of the eye. As with lupus generally, the disease may undergo spontaneous healing in one part while extending in another. But the ciliated epithelium is not renewed, and when there is any considerable destruction over the turbinals a permanent state of atrophic rhinitis will be left behind (cf. pp. 7 and 140). The lesions, as a rule, are bilateral.

The progress of the disease is always slow, and may extend over years, or even over a lifetime. It may become arrested for

* StClair Thomson, *Journ. of Laryngol.*, xxii., 1907, No. 8.

† F. J. Steward, *Guy's Hosp. Repts.*, liv., 1900, p. 149.

Chichele Nourse, *Proc. Roy. Soc. of Med.*, Laryngol. Section, Feb., 1909, p. 94.

‡ Clement F. Thiesen, *Albany Med. Ann.*, xix., 1898, No. 3, p. 156.

considerable periods of time, while, under adverse conditions, it progresses more rapidly. Want of local attention, general ill-health, and pregnancy are among these adverse conditions. The disease is sometimes accompanied by intercurrent attacks of erysipelas, and occasionally these are followed by some amelioration of the symptoms. The glands in the neck may be enlarged (Caboche).

Symptoms.—The symptoms are those of obstruction (p. 90) and catarrh. The disease is painless, and catarrh is slight until crust-formation and fetor are apparent. Consequently, patients are apt not to apply for relief until the disease is well advanced.

Diagnosis.—The disease is most frequently mistaken for syphilis, particularly the inherited form. A reference to the chapters on Syphilis (pp. 659 and 694) will show that in the latter disease the bones are more apt to be affected, the discharge and fetor are more marked, and progress is more rapid. Rhinoscleroma, which is very rare, does not ulcerate and presents characteristic hardness. A tuberculoma on the septum might be mistaken for a malignant growth, but it is easy to remove a portion and submit it to the microscope. In doubtful cases the test of anti-syphilitic treatment should be employed, and this is particularly necessary if inherited syphilis is suspected. Should the intranasal affection be solitary and the diagnosis still in doubt, the reaction to tuberculin might be employed (p. 645). In a large proportion of cases the diagnosis will be rendered easy by the discovery of lupus nodules on the skin of the face, or of lupus infiltrations or scars in the pharynx or larynx.

‡ It is of great importance to make a correct and early diagnosis of primary lupus in the nose or the vestibules, as the disease may not only be arrested but its extension to the face may be prevented. Inspection of the vestibules without the use of a speculum (Fig. 70, p. 120), and the suggested application of adrenalin to doubtful points on the septum, will be found helpful.

Prognosis.—If lupus is diagnosed before the infiltration is widespread and the nodules have ulcerated, the process may be arrested. When it is limited to the anterior part of the septum or inferior turbinal, further damage may be long delayed, although the patient must be prepared to keep up the toilette of the residual atrophic condition. But when the disease has extended into the deeper recesses of the nose, and the epithelial and secreting tissues are extensively destroyed, the prognosis must be more guarded. Relapses are not by any means due to morbid tissue being overlooked at the time of operation. Fresh deposits in healthy areas may take place at any time in a lupus patient. A cogent reason

for frequent observation and active treatment is, as already pointed out, that the nasal cavity is often the cradle for lupus of the face.

Treatment.—There is not the same tendency to spontaneous healing in the nose that there is in lupus of the larynx. Consequently, local treatment should be energetic and persistent. When the condition is met with before the apple-jelly infiltrations have broken down into an ulcerating, mammillated surface, excellent results can be obtained by the use of a fine galvano-cautery point (p. 67). This is introduced into the centre of each nodule, and the healthy tissue around should be carefully respected. When the nodules have broken down, the cautery can be used more extensively, and if applied around the margin of the diseased area it stimulates a limiting fibrosis. The cautery applications may require repeating every ten to twenty days, and should be followed by the introduction of a mercurial ointment (Formula 75), or tampons soaked in iodine (℞ Iodi pur. 1'0, pot. iod. 2'0, aquæ 2'0). In more extensive cases the tampons might be soaked in 1-1,000 sublimate lotion, or, if this proves irritating, in 1-700 solution of permanganate of potash. These tampons can be left in position for periods varying from two to twenty-four hours. Chromic acid can be employed if the cautery is not available (p. 69).

When a lupus-tumour of the septum is met with it should be freely excised. This may be effected by raising the muco-perichondrium below the growth (as we do in submucous resection of the septum, p. 170), or it may necessitate a permanent perforation of the septum, but the perforation does not lead to any falling-in of the bridge of the nose, and a complete removal may prevent further mischief.

If the case only comes under notice when the nasal cavity is extensively invaded, a general anæsthetic is administered, a post-nasal sponge is employed to avoid complication from troublesome hæmorrhage, and all the diseased tissue is thoroughly scraped with a Volkmann spoon or ring-knife.

Lupus in the vestibule of the nose is, unfortunately, often overlooked. Early cases can be well treated with the galvano-cautery. When infiltration and ulceration are pronounced, the skin should be well scraped under a general anæsthetic. Subsequent contraction from scarring is best avoided by wearing in the nostrils short lengths of rubber drainage-tubes, or Mayer's vulcanite splints (Fig. 90). These are smeared with mercurial ointment, and the patient soon learns to remove them for cleansing purposes. They are conveniently worn at night.

Pyrogallic acid ointment (10-20 per cent.) has been recom-

mended. Ribbon gauze is soaked in it, and tucked into the nose after curetting. This is renewed every twenty-four hours.*

If at any time the interior of the nose is found to be irritated the following is a useful preparation, applied on tampons:—

R Resorcin	.	.	gr. iiss	.	.	0·16 grm.
Balsam of Peru	.	.	gr. iiss	.	.	0·16 grm.
Glycerin	.	.	ʒi	.	.	30·0 grm.

Treatment by hot-air cauterization (p. 66) has been recommended.† Lactic acid I have found to be useless and irritating, and it is discarded at the Finsen Institute (Christiansen). It might be tried in extensive cases in 75 per cent. solutions, applied on pledgets of cotton-wool, which are left in place for fifteen to thirty minutes, and employed three times a week. The insufflation of powders only leads to crust formation, and they are better avoided.

Nascent iodine has lately been strongly recommended when administered by what is generally termed Pfannenstill's method. Iodide of sodium in doses of $\frac{1}{2}$ grm. ($7\frac{1}{2}$ gr.) is given six times a day. The diseased area in the nose is well cleansed, and strips of ribbon gauze are closely applied and kept soaked with a solution of hydrogen peroxide, which the patient instils with a pipette several times a day. As the production of nascent iodine is favoured by the presence of an acid medium the following solutions are used: (1) 100 grm. of a 3 per cent. solution of hydrogen peroxide plus 5 gr. of acetic acid; (2) 100 grm. of a 1·5 per cent. solution of hydrogen peroxide plus 50 cg. of acetic acid. During the first few days of the treatment the stronger solution is well applied until a marked reaction with swelling of the mucous membrane appears. Then the weaker solution is used until the ulcers are healed and infiltration has disappeared. Sixteen days to three months may be required to effect a cure. For lupus of the hard palate the gauze strips can be kept in place by a false palate. The treatment cannot be employed if there is active phthisis.‡

Radium is strongly recommended by Broeckaert as at present the best treatment for lupus of the nose and throat.§

Throughout the case the patient must maintain careful cleansing of the nose with alkaline lotions, followed by mercurial ointment or paroline sprays. Crusts must be softened by wearing tampons soaked in the balsam of Peru mixture. Treatment by electrolysis, and by Röntgen rays or Finsen light, is so ineffective and

* Wittmack, *Rev. Hebd. de Laryngol.*, xxv., 1904, No. 9, p. 266.

† E. Hollaender, *Berlin. klin. Woch.*, June 4, 1906.

‡ *Brit. Med. Journ.*, March 23, 1912, p. 689.

§ *Soc. Franç. d'Oto-laryngol.*, 1912.

uncertain that it is only apt to lead to loss of time. Of course, these or other methods may be used to any skin lesions, to prevent re-infection. It is hardly necessary to mention that such proceedings as a Rouge operation are absolutely uncalled for. The remaining atrophic condition may be relieved by the use of Mandl's solution, massage, *and* the wearing of tampons (*see* Treatment of Atrophic Rhinitis, p. 145, and General Treatment of Lupus, p. 628.)

Results.—The above measures will in many cases arrest the disease, and in others will give long periods of relief. The treatment has often to be spread over a considerable time. Recurrence is apt to take place, and the patient should report from time to time, so that fresh outbreaks may be promptly treated.

LUPUS IN THE NASO-PHARYNX

In this region the disease is rarely encountered. Holger Mygind only found five instances in 129 patients with nasal lupus. It may occur as an infection from the nose, and then is met with in the form of a lupus infiltration in the centre of the posterior wall. Or the disease may spread from the nose by direct continuity, or extend upwards from the pharynx to the posterior surface of the soft palate. From the naso-pharynx it may pass along the Eustachian tube to the ear.

Tuberculoma has rarely been met with, originating from the region of the choanæ, projecting into the postnasal space in the form of a non-ulcerating tumour, and as large as a small apple. Removal has not been followed by any recurrence of the lesion.*

Symptoms.—The destruction of the ciliated epithelium in this region leads to distressing dryness, with accumulation of adherent crusts. The process does not extend below the surface, but when arrested it leaves a permanent condition of atrophic postnasal catarrh.

Diagnosis.—The crusting need not give rise to any confusion with syphilis. The latter progresses more rapidly, is more acute in type, causes rapid destruction of tissue, and healing is followed by contracting scars. Other differences are indicated under Syphilis. In rhinoscleroma, which may occur primarily in the postnasal space, crusting is met with, but the cartilage-like infiltration is almost characteristic.

Treatment.—There is not the same proliferating infiltration which we meet with in lupus of the nose. Consequently the curette is seldom required. The section on treatment of nasal lupus should be consulted (p. 620). Early deposits are best treated

* Koschier, *Wien. klin. Woch.*, 1895, Nos. 36-42.

with the galvano-cautery, the treatment of the nasal condition should be pursued diligently, and the resulting atrophic catarrh must be relieved (*see* Atrophic Postnasal Catarrh, p. 356).

LUPUS IN THE PHARYNX

Lupus in the pharynx may occur primarily ; it may be secondary to the laryngeal disease, but is more commonly a descending infection from the nose. Deposit takes place in the form of minute, discrete,



Fig. 272.—Lupus of the palate, uvula, and pharynx.

This developed in the same case as Figs. 273 and 274, and after the larynx had quite healed.

pinhead points, generally pinkish with a yellowish apple-jelly-like centre. The local use of adrenalin will bring out these characteristics. As the deposit increases, the surface becomes bosselated, the epithelium is destroyed, and when the sticky secretion is wiped away the invaded area shows gelatinous, greyish mounds, separated by narrow crevasses, suggesting a worm-eaten appearance. There is no reaction, and no red aureole around the healthy margin.

The uvula may be primarily affected,* but the favourite site is the anterior pillars of the fauces and adjoining soft palate. This loses its elasticity, and becomes insensitive and wooden (Fig. 272).

* Edward E. Willis, "Primary Tuberculosis of the Upper Respiratory and Alimentary Tracts, with report of two cases of primary tuberculosis of the uvula," *Laryngoscope*, xviii., 1908, No. 8, p. 621. (Gives a full bibliography.)

The uvula may shrink to a mere knob. Further damage to the soft palate occurs from the extension of the disease to its posterior surface, so that the elastic membrane is shrivelled and reduced to a small cicatricial curtain. The tonsils generally escape, but lupus deposits, with more marked ulceration, may take place on the root of the tongue and the adjoining parts of the gums. An isolated deposit may occur on the roof of the mouth, in the centre of the hard palate. The bone may be exposed, but is not itself invaded, so that perforation of the palate need not be feared. A similar condition may appear on the posterior pharyngeal wall. The glands are not enlarged, as a rule, but they may be very marked.

Symptoms.—These are generally very slight, and often amount to no more than a sense of discomfort in the throat with a feeling of stiffness. There may be a little inconvenience in swallowing, but regurgitation of fluids into the nose, or nasal voice from palatal insufficiency, is not marked, and these symptoms are only complained of in extensive disease.

Diagnosis.—The age and sex of the patient, the insidious onset and slow progress, the absence of marked reaction, the presence of lupus on the face, or the detection of it or its scars in the nose or larynx, will generally settle the diagnosis. This may be confirmed by the other points mentioned in the section on the disease in the nose (p. 619). Syphilitic lesions are surrounded by an aureole of inflammation; the disease is more rapid; it does not spare the tonsils or the bones, and the resulting scars, by their marked tendency to contract, leave much greater deformity and discomfort afterwards. Confirmatory stigmata of syphilis are usually discoverable.

Leprosy is rarely met with, and then mostly in males. The anæsthesia is more marked; it generally attacks the centre of the hard and soft palate; the resulting scars are more accentuated, and skin lesions are seldom absent (cf. Plate xxii., facing p. 708).

Prognosis.—In the pharynx the tendency to spontaneous healing is not so marked as in the larynx; but it is more evident than with lupus in the nose, and under treatment the prognosis is good. Still, even when arrest is apparently complete, minute recurrences are apt to take place in the neighbourhood of the healed area. Patients frequently become quick to detect these spots, which, if promptly cauterized, will not extend.

Treatment.—The electric cautery, combined with the general treatment to be described later, gives such good results that I seldom employ any other remedy in the pharynx. When, however, the hard palate is deeply involved, free curetting under a general anæsthetic is required, and the same method is advisable if the disease is well advanced in any area of the pharynx when the case

first comes under observation. Paquelin's cautery is very useful in the mouth and pharynx. Radium or nascent iodine may be tried (cf. p. 620). The other local measures suggested in lupus of the nose (p. 620-2) may be indicated. For general treatment, see p. 628.

LUPUS IN THE LARYNX

Lupus is relatively rare in the larynx. It is also uncommon for it to be met with there as a primary affection.*

Etiology.—According to Escat, lupus is never met with in the larynx unless the disease, or the scars left by it, are visible in the nose or naso-pharynx. I have seen primary lupus in the larynx, or at least with such a small amount of scarring and atrophy in

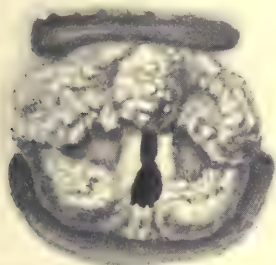


Fig. 273.—Primary lupus of the larynx.

Shows the appearance in 1901, when the patient was aged 19. (Cf. Fig. 274.)



Fig. 274.—Primary lupus of the larynx.

Shows the healed condition in 1904, when the patient was aged 22. For original condition see Fig. 273. (From the same case as Fig. 272.)

the nose that it was impossible to say if it was due to a preceding lupus.† Lupus originating in the larynx may extend to the pharynx (see Figs. 272 and 273).

Pathological anatomy.—The favourite site is the epiglottis. The deposit takes place by numerous discrete points, which are readily seen, as this surface is frequently anæmic. The nodules coalesce and ulcerate to form an irregular shallow ulcer, with ill-defined margins, coated with very scanty secretion, and with so little reaction that it is sometimes difficult to define its exact extent. Ulcers may be separated by areas of infiltrated or healthy tissue. The whole epiglottis may be deformed, so as to look thickened, twisted, or squat in parts. With the progress of the affection it may be quite destroyed, so that a mere stump is left. As the base of the epiglottis

* Gouguenheim and Tissier, "Phthisie Laryngée," p. 255. Paris, 1889.

† Emil Mayer, "Primary Lupus of the Larynx," *Trans. Amer. Laryngol. Assoc.*, xxxvi., 1914, p. 209.

is approached, spontaneous arrest frequently occurs. It is very usual for the centre of the epiglottis to be completely eaten away, leaving a central **V**-shaped gap with irregular edges (Fig. 273). Lupus deposits also take place on the arytenoids, the ary-epiglottic folds, and the ventricular bands. This whole area may be converted into a grey, ulcerating, mammillated surface, but characterized by scanty secretion, an anæmic look, and the absence of local reaction. The vocal cords are generally respected, but nodular deposit and ulceration may take place in them. All this area may cicatrize, even without local treatment, so as not to leave any visible trace of disease behind. (Fig. 274.)

Symptoms.—Symptoms may be so completely absent that a patient will sometimes present the evidence of a spontaneously healed epiglottitis, and yet be unaware that anything was ever the matter with the larynx. There is often some anæsthesia, but not enough to cause trouble in swallowing. Cough is absent or slight. The use of the voice is not painful, but it becomes hoarse and harsh as the glottis is approached. This space may be so invaded that stridor is induced and tracheotomy becomes necessary. There is seldom dysphagia.

Diagnosis.—The appearances described, and its slow and painless progress, as well as its healing tendency, are generally sufficient to distinguish the affection. There are frequently confirmatory signs of lupus in the pharynx, nose, or skin of the face. If necessary, the confirmatory evidences described in the section on the nose may be sought for (p. 619). From leprosy the diagnosis is made by remembering that lupus occurs chiefly in females who have not been exposed to leprosy infection, and that the latter disease in the larynx would always be preceded by changes in the nose, pharynx, or skin. With syphilis there is little likelihood of confusion, except in the case of the inherited form. The distinction is best made by administering specific treatment; syphilis will improve under it, while lupus may be rendered more evident or even be aggravated.

As it is important to diagnose tuberculosis from lupus in the larynx, the following table has been adapted from Escat :—

DIAGNOSIS OF LUPUS AND TUBERCLE OF THE LARYNX

<i>Lupus</i>	<i>Tubercle</i>
Numerous discrete points.	Diffuse infiltration.
Respects the cartilages, with the exception of the epiglottis.	Rapidly infiltrates the deep tissues. Respects none of the cartilages, and is particularly apt to invade the crico-arytenoid joint.

Lupus

Never causes œdema.

Serpiginous ulceration, with tendency to spontaneous healing.

Secretion slight, and tends to dry in sticky patches.

Indolent and painless.

Dysphagia exceptional, even when the epiglottis and arytenoid regions are affected.

Surface inclined to be anæsthetic as in leprosy.

General health and lungs may remain unaffected indefinitely, perhaps for a long lifetime.

Heredity is not marked.

May spontaneously undergo complete and enduring cure; or heal in one part while fresh deposits take place in another. Responds satisfactorily to local treatment.

Tubercle

Edema, or œdema-like infiltration, not uncommon.

Rarely shows any inclination to spontaneous healing.

Surface always moist, and often puriform.

Progressive and frequently painful.

Dysphagia is the rule as soon as the epiglottis and arytenoids are invaded.

Hyperæsthesia is nearly constant.

General health may appear satisfactory in a few cases, but it is only temporary; if the patient is not treated, the quiescent lesions in the lungs will manifest extension within a few months.

Heredity is frequent.

Epiglottis never heals spontaneously; shows no tendency to spontaneous arrest, and its invasion is often an indication of rapid progress of the disease, both local and general. Local treatment must be applied cautiously. In unsuitable cases it greatly aggravates the disease.

Lupoid tuberculosis.—Between the typical forms of lupus and tuberculosis there are intermediate types of what we might call "lupoid" tubercle. This, also, principally affects the epiglottis, but appears in other parts of the larynx. It is less inclined to heal spontaneously, but responds readily to treatment. Though hoarseness may be present, there is little pain in speaking. Dysphagia is more apt to occur than in cases of lupus, but is not so acute as in typical tuberculosis. General symptoms are present, but not so accentuated as in the latter condition. The lungs are commonly affected, but with a slow or limited infection. Wasting and fever are not marked, and tubercle bacilli are scanty or even absent. In this "lupoid" form there is no evidence, past or present, of lupus nodules in the pharynx, nose, or skin.

Prognosis.—The prognosis of lupus of the larynx is good. It may heal spontaneously, and almost at any stage it will respond satisfactorily to treatment. Even if stenosis is so marked that tracheotomy is required, this does not prevent, but rather promotes, complete healing, although occasionally the tube may have to be worn indefinitely.

A careful study of the records of tuberculous laryngitis suggests that in many instances it was doubtless these cases of lupoid disease which figured prominently as "cured" tuberculosis of the larynx. The diagnosis of the typical "lupus" as well as of the "lupoid" form is, therefore, of the greatest importance in prognosis, and no case-description of the laryngeal appearances is complete without a full investigation of the whole respiratory tract, and also of the sputum, temperature, and skin.

Treatment.—The spontaneous healing which frequently occurs in this affection takes place in the absence of any special care, or even of voice-rest. There does not appear to be any gain in prohibiting ordinary use of the voice, particularly as the ary-epiglottic articulation is seldom invaded. Healing is promoted by the avoidance of the usual irritants of the larynx—dust, alcohol, and tobacco,—attention to the pharynx and nose, and the general care of the health.

Just as lupus of the larynx may heal under no treatment, so it appears to improve under various remedies. We must therefore be guarded in attributing special effect to any particular method, but the application of the galvano-cautery point under cocaine is certainly followed by marked and steady healing. It is equally suitable for all parts of the larynx, but care should be taken in making applications to the anterior commissure for fear of producing adhesions. For methods of application, *see* p. 651. If the whole epiglottis is infiltrated, or there are fungating masses on the ventricular bands or projecting from the interarytenoid space, they may be first nipped off with the cutting forceps.

Chromic acid fused on a probe (p. 69) may be employed instead of the cautery. I have found no benefit from lactic acid, though Lake's strong pigment may be useful (p. 650). A laryngeal spray of 1 per cent. formalin might be tried. Further suggestions for treatment will be found in the section dealing with lupus of the nose (p. 620).

General treatment is important.

GENERAL TREATMENT OF LUPUS

This must be carried out in all cases, both to promote local healing and to prevent the development of tuberculosis in the lungs or elsewhere. Not that it is common to find the nose affected in pulmonary tuberculosis. Willigk only found the septum affected once in 450 instances.* The patients are frequently anæmic, and feeble in physique and vitality. Their general habits of health and hygiene require attention, particularly in reference

* *Präger Vierteljahrschr. f. prakt. Heilk.*, Bd. xxxviii., 1853.

to fresh air, diet, rest, and exercise. Cream, butter, eggs, and fattening foods should form a good part of the diet, and cod-liver oil, maltine, iron, strychnine, and arsenic are often indicated. Arsenic is so strongly recommended by Lack that he considers it beneficial in all lupous affections of the upper air-passages, and even a specific when the pharynx is involved.* I have not been able to confirm this. Tuberculin injections have been employed, and in some cases good results have been obtained.† In my own experience the treatment is sometimes disappointing, and many patients have felt that their symptoms were aggravated.

TUBERCULOSIS

TUBERCULOSIS OF THE NOSE

It has already been pointed out that tuberculosis attacks the nose almost exclusively in the form of lupus (p. 614). It is certainly the only type which primarily invades the pituitary membrane.

Acute miliary tuberculosis is extremely rare in the nasal cavity, and it is said that the appearance of an eruption of discrete, minute, grey, millet-seed tubercles on the Schneiderian membrane has only twice been recorded.‡ They occur on the inferior turbinal, and rapidly undergo ulceration. The ulcer resembles the tubercular ulcer of the tongue, surrounded by a collarette of miliary tubercles. It affects the anterior region of the nasal fossæ, the septum and neighbouring part of the upper lip. It is frequently painful; scrapings yield numerous tubercle bacilli; and pulmonary phthisis is always present. These characters distinguish it at once from lupus of the nose.

CHRONIC TUBERCULOSIS OF THE PHARYNX

Lupus is the most common form of chronic tuberculosis of the pharynx (p. 623). Chronic tuberculous ulcers are rarely met with, although they are found on the anterior part of the tongue in phthisical subjects, who infect themselves, secondarily to some slight traumatism.

Some authors describe a chronic fungating and ulcerating form, chiefly affecting the palatal and lingual tonsils.

ACUTE MILIARY TUBERCULOSIS OF THE PHARYNX

Etiology.—It is questionable if this ever occurs primarily. It is a rare complication of pulmonary tuberculosis. It generally

* *Proc. Laryngol. Soc., London*, xii., Dec., 1904, p. 23.

† Hunter Tod, *Practitioner*, May, 1908, p. 703.

‡ Henri Caboché, *loc. cit.*, p. 347.

affects adults, but may be met with in old people of 76 (Moure), or in children of 8.* It is said to be more common in men than in women (Rosenberg).

Pathological anatomy.—Acute tuberculosis attacks the mucous membrane of the fauces, spreading on to the soft and hard palate, the pharynx, the base of the tongue, and the epiglottis. There is an eruption of minute, pearly-grey tubercles, or yellow spots, as in lacunar tonsillitis. At first they are under a covering of epithelium, but this rapidly breaks down into small, superficial, clearly defined ulcers, with an ashy-grey, sloughing base. These coalesce into an area covered with a dirty, greyish-white, membranous deposit. On being wiped away this leaves a raw, bleeding, mouse-nibbled surface on the velum, uvula, fauces, and possibly the posterior pharyngeal wall. It may extend to the cheeks and epiglottis. The soft palate is pale and paretic, and the uvula is red, glistening, and oedematous. The glands at the angles of the jaws are frequently involved. They may be mobile and not painful, or may break down into an abscess.

Symptoms.—The process is an acute one, and is always accompanied by marked aggravation of the general symptoms of tuberculosis. In addition there is acute pain radiating to the ear, dysphagia, increased salivation, anorexia, rapid wasting, and fever. The palatal insufficiency may allow of regurgitation of fluids through the nose. There is great difficulty and distress in clearing the throat of tenacious mucus. The voice is throaty and painful.

Examination.—The onset of the disease is insidious, so that a case seldom comes under observation until the tough, adherent, whitish membrane has formed. At first sight this is very suggestive of diphtheria. The oedema of the uvula shows the acuteness of the process. There will generally be a history of tuberculosis, with evidence in the larynx, lungs, and sputum, though a few cases have been recorded in which the pharyngeal symptoms were far advanced before careful examination of the lungs could reveal any evidence of tuberculous deposit.†

Diagnosis.—If the appearances and history are not sufficient to distinguish the membrane from that of diphtheria, the absence of the Klebs-Löffler bacillus will determine it. Tubercle bacilli may be found in the exudation in the throat, as well as streptococci and diplococci. The condition is not likely to be confounded with syphilis.

* Escat, "Maladies du Pharynx," p. 374. Paris, 1901.

P. Schoetz, *Deut. med. Woch.*, Oct. 15, 1903; and *Brit. Med. Journ. Epitome*, Jan. 16, 1904.

† Walter F. Chappell, *N.Y. Med. Journ.*, Sept. 19, 1896.

Prognosis.—This is always serious. Death from rapid wasting and inanition may ensue in from three weeks to three months. I have known it to occur suddenly from heart-failure.

Treatment.—It is important to remember that these cases are hopeless, and that efforts to arrest the local disease by caustics only aggravate the misery of the patient's pitiable condition. The mouth and throat are kept as clean as possible with antiseptic lozenges (Formulæ 43 and 46), as gargling or spraying is too painful and fatiguing. Pain is relieved by insufflations of orthoform, or sprays of cocaine, or a morphine tablet on the tongue. Hypodermic injections of heroin or morphia should not be spared, and the patient must be given any nourishment that he can swallow. (See Treatment of Laryngeal Tuberculosis, p. 648.)

CHAPTER XLIV

TUBERCULOSIS OF THE UPPER AIR-PASSAGES (Concluded)

TUBERCULOSIS OF THE LARYNX

Synonyms.—*Tuberculous laryngitis ; laryngeal phthisis.*

Tuberculosis of the larynx is particularly interesting on account of its frequency, gravity, and the importance it bears to prognosis.

Frequency.—Tuberculosis is met with more frequently than any other specific disease affecting the larynx. The relative frequency of laryngeal involvement in patients with pulmonary tuberculosis is found to vary in different statistics from 3 to 25 per cent.* Even in sanatoria, where laryngeal cases are avoided, tuberculosis in the larynx is met with in from 6 per cent. (Laub) to 25 per cent. (StClair Thomson) of the inmates.† As the frequency with which the larynx is involved increases with the duration of the pulmonary disease, post-mortem examinations show the larynx to be involved in 48 to 83 per cent. of fatal cases.‡ Recent clinical statistics show that while infrequent in the first stage (10.5 to 13.7 per cent.), it occurs in 72 per cent. in the third stage of phthisis (Laub). Of the 53,000 consumptives who die annually in England and Wales,§ at least 25,000 must have laryngeal tuberculosis; and it would not be an exaggeration to say that amongst the 350,000 to 400,000 at present suffering from tuberculosis in the United Kingdom there are 80,000 to 100,000 patients annually requiring relief for laryngeal symptoms.

Etiology.—Primary tuberculosis of the larynx, as shown by post-mortem integrity of the lungs, is so extremely rare that for practical purposes its possibility may be neglected.|| When cases are met with where no pulmonary lesion can be detected, this is simply

* Frese, *Munch. med. Woch.*, 29 März, 1904, p. 552.

Percy Kidd, "Allbutt's System of Medicine."

† StClair Thomson, *Brit. Med. Journ.*, April 11, 1914.

‡ S. H. Habershon, *Journ. of Laryngol.*, Dec., 1905.

Heinze, "Kehlkopfschwindsucht." Leipzig, 1879.

Percy Kidd, *op. cit.*

P. H. S. Hartley, *Rept. Patholog. Dept., Brompton Hosp.*, 1900-1903.

George Fetterhoff, *Trans. Amer. Laryngol. Assoc.*, 36th Meeting, 1914, p. 258.

§ H. H. Asquith, *Cong. of Nat. Assoc. for Prevent. Consumption*, London, Aug. 1, 1913.

|| Demme, "Ein Fall von primär Kehlkopftuberculose." Bern, 1883.

Pogrebinski, *Medycyna*, 1887, No. 14.

Orth, *Lehrb. der Patholog. Anat.*, 1887, i. Th., S. 319.

E. Fraenkel, *Deut. med. Woch.*, 1886, No. 28.

Manasse, *Arch. f. Laryngol.*, xix., 1907, Heft 2, S. 240.

because our present methods of investigation are inadequate to detect early or limited deposits in the chest.

Paths of invasion.—Infection of the larynx from the lungs may take place (*a*) from the surface of the mucous membrane by the sputum, or (*b*) from the submucous area where the tubercle bacilli arrive from the lungs by the blood- and lymph-streams.

The former is the older theory, advanced by Louis,* and founded on the observation that the posterior half of the larynx, where sputum is apt to collect and linger, is the part most frequently attacked. The objection made to this theory, viz. that tuberculosis is rare in the trachea and bronchi, where sputum accumulates for even longer periods, is met by the explanation that the surface of the larynx is more apt to be irritated, and perhaps abraded, by catarrh, over-use of the voice, and coughing, so making it a *locus minoris resistentiæ*.

The theory that infection is carried from the lungs to the larynx by the vascular and lymphatic channels, principally supported by Heinze, is founded on the observation that deposits are met with below intact epithelium, and, therefore, could not have been infected from the surface.† But it is now recognized that tubercle bacilli can pass through or between healthy epithelium and leave it intact.‡ Another argument adduced to support this view is that the larynx is first, or principally, attacked on the same side as the affected, or most affected, lung.§ In cases with well-marked affection of one lung, the larynx has been found invaded on the same side in 84·6 per cent.|| But this view, though commonly, is not unanimously accepted.¶

The chief argument in favour of infection by the vessels is that infiltration and ulceration may be extensive in the larynx when there is little or no sputum passing over it; that tuberculosis may develop in the larynx in cases where the sputum has ceased to contain bacilli; and, on the other hand, that the larynx may remain healthy in long-standing cases of phthisis, although constantly bathed in sputum laden with bacilli.

The tubercle bacilli arriving by the blood- or lymph-stream excite small perivascular follicles, and then, by union, a more diffused infiltration. These follicles undergo necrosis at their centres, owing to obliteration of vessels, and tend to ulceration, which spreads deeply according to the amount of infiltration. This does not negative the possibility of infection from erosion or superficial ulceration of the epithelial surface. The process, in the latter case, does not tend to spread deeply, and may heal readily and even spontaneously, and tubercular foci cannot be found on their margins. This possibility

* "Recherches sur la Phthisie." Paris, 1825.

† Heinze, *op. cit.*

‡ E. Fraenkel, *Virchow's Arch.*, Bd. cxx., 1890, and *Deut. med. Woch.*, 1891, No. 19.

J. Wright, *N.Y. Med. Journ.*, Sept. 26, 1896.

§ Türk, Schech, Schrötter, Friedreich, Schnitzler, Schaeffer, R. Pfeiffer, and Robert Krieg, *Arch. f. Laryngol.*, viii., 1898, S. 519.

|| Hanna Maimin, *Zeitschr. f. Laryngol.*, i., 1908, Heft 2, S. 267.

¶ Jurasz, M. Schmidt, Magenau, Frese, Blumenfeld, Besold and Gidionsen, and L. Laub, *Arch. f. Laryngol.*, Bd. xxi., 1909, S. 58.

is supported by what is known of infection through acini or glands.* According to the view of vascular infection the bacilli must lie deeply buried and protected, while in that of surface contact they are superficial and accessible. In the latter mode of infection the type of epithelium in different parts of the larynx may help to explain local predisposing causes. The arytenoid and interarytenoid regions and the edges of the vocal cords are the parts most commonly invaded, i.e. the regions covered with papillated mucous membrane and tessellated epithelium, and not protected by ciliated epithelium.†

Tuberculosis in the larynx may very rarely be part of a general miliary tuberculosis.

Influence of sex.—Tubercle attacks the larynx of male consumptives twice as often as that of females.

Morell Mackenzie gives the proportion in hospital out-patients as 2·7 males for 1 female. According to the post-mortem records of 10 years at the Brompton Hospital, the larynx in females is infected in 28·85 per cent. of cases of pulmonary tuberculosis, and in males in 56·27 per cent.‡

This agrees with the greater predisposition of males generally to throat affections, and is probably due to their more frequent abuse of alcohol and tobacco, and exposure to dust in workshops, mines, and factories.

Influence of age.—The disease is most frequently met with between the ages of 20 and 40, diminishing at each end of that period.

This is not simply due to the fact that pulmonary tuberculosis is more frequent in these decades, for the relative as well as actual frequency of laryngeal disease diminishes under 20, and over 50 (Heinze). Still, there is no limit to its occurrence as life advances, and then it is apt to be met with in less characteristic forms, and before the lungs are manifestly affected. According to Moure it may run a very rapid course in the aged. Though not unknown in childhood, it is rarely met with under 10 years of age.§ Of 500 cases examined by Mackenzie, only one was under 15 years of age. In 100 autopsies he found the larynx diseased once between the ages of 5 and 10, 4 times between 10 and 15, and 16 times between 15 and 20. The immunity in early life may be due to different causes: (1) Tuberculosis in childhood is apt to run a rapid course, before laryngeal complications have arisen; (2) the larynx of the child is not predisposed to infection by abuse of alcohol and tobacco, or by working in foul, dust-laden atmospheres; (3) it is more elastic and more resistant.

Chronic catarrh of the nose and throat.—An enfeebled condition of the laryngeal mucosa, frequently secondary to infective or obstructive nasal disease, would appear to be a predisposing cause.

* Cornil and Ranvier.

Jobson Horne, *Lancet*, Aug. 20, 1898.

Jobson Horne, *Journ. of Laryngol.*, xxii., 1907, No. 7, p. 281.

† S. H. Habershon, *ibid.*, Dec., 1905.

‡ S. H. Habershon, *loc. cit.*

§ Perrin, *Rev. Hebdom. de Laryngol.*, Jan. 18, 1902.

Occupation.—Sedentary and dusty occupations conduce to pulmonary tuberculosis, but there are no figures to show that they conduce to the larynx being particularly affected. I have met with the disease in singers, although voice-use is generally regarded as a protection against tubercular infection.

Syphilis is not uncommonly met with preceding or associated with tuberculosis.

Alcohol, dust, and tobacco are well-known etiological factors in all laryngeal affections.

Symptoms.—There may be an entire absence of subjective symptoms in early or slight cases, and hence the importance of a laryngoscopic examination in every suspected case of pulmonary tuberculosis, and a periodical inspection in all chronic cases. Of 114 patients, Laub found that 64.9 per cent. had no complaint of the larynx, 32.5 per cent. had hoarseness and cough, and only 2.6 per cent. had pain in the larynx and odynphagia.

Cough is not an important early symptom. It is generally bronchial or pulmonary in origin. In many cases it is completely absent, even in long-standing and extensive disease. In others there is a cough which is phlegmy and incomplete, and may be accompanied by vomiting. Occasionally the cough may resemble whooping-cough, and then may be due to glandular enlargement and pressure on the recurrent laryngeal nerve. Any sputum comes principally from the lungs; it may remain absent for years, if the lungs are not breaking down. The secretion from laryngeal ulcers is mucoid or muco-purulent. Very rarely it is faintly streaked with blood. It is seldom that tubercle bacilli can be found in it. In later stages it may contain bits of necrosed cartilage.

Paræsthesia or subjective sensations in the larynx are common. A feeling of uneasiness, fullness, or irritation may excite hemming and clearing in the throat. Change in the voice, at first absent or slight, is generally progressive, but will depend on the situation and stage of the lesion. Generally the voice tires easily, lowers in pitch, and becomes weak and bitonal. It may sound weak, dull, rough, woolly, or hollow and toneless, but is seldom rasping and raucous. Later on the voice is thick, phlegmy, and at times aphonic. It may become reduced to a hollow whisper. Dyspnœa is seldom an early symptom, and its gradual onset is generally due to progress of the pulmonary disease. It may become marked and accompanied with stridor if fixation of the cords takes place, or if the glottic or subglottic spaces are invaded by large infiltrations or granulations. Pain and tenderness over the larynx are seldom complained of, except in cases of perichondritis. Odynphagia may occur in the absence of ulceration, being due to infiltration,

perichondritis, infiltration of muscles (Schmidt), or neuritis in the nerve-endings in the arytenoids.* Dysphagia is common in fatal cases, being present in one-third of Mackenzie's 500 cases. Otalgia may be complained of.

The general symptoms of laryngeal tuberculosis are not always proportionate to the laryngeal lesion, and, with the exception of dysphagia, are due more to the pulmonary than to the laryngeal changes. However, it is rare for tuberculosis to invade the larynx unless preceded or accompanied by some of the following general symptoms, viz. general fatigue, depression of strength, neurasthenia, indigestion, progressive wasting. Amongst early symptoms a unilateral dilatation of the pupil and a red line on the gums have been observed, and atrophy and tenderness of the muscles covering the apices of the lungs. Tachycardia, rise of temperature, and a history of hæmoptysis or pleurisy will often be noted.



Fig. 275.—Tuberculosis of the larynx.

Specimen from a patient who died of pulmonary tuberculosis. It shows, in the usual site, the early appearances of laryngeal tuberculosis, viz. infiltration and abrasion of the interarytenoid region and the area above each processus vocalis. (*Sz. Bartholomew's Hosp. Mus., No. 1613a.*)

Examination.—The lesions produced by tuberculosis in the larynx vary according to their situation, extent, age, and intensity. They are met with in three stages: (1) deposit and catarrh, (2) ulceration and proliferation, (3) perichondritis. But these periods are ill-defined, and lesions in all three stages may be met with concomitantly. No attempt at a complete description of the appearances is therefore possible, and it will be better to study the usual distribution of lesions and the ordinary onset of symptoms, remembering that it is unusual to

find the process limited to one area, and that, as a rule, the infiltrations in different regions are mingled in various combinations.

Liability to infection of different parts of the larynx.—The posterior half of the larynx is the part most frequently affected (Fig. 275). The arytenoid and the interarytenoid region, rich in glands, exposed to mechanical injury from the constant movement of the cords, and subject to irritation from the lodging of sputum, is the first part to be attacked in the great majority of cases, and it is seldom that it does not share in other laryngeal lesions. This region is, indeed, the seat of disease twice as often

* M. Dansac, *Ann. des Mal. de l'Oreille*, 1893, p. 1041.

as the vocal cords, and three times as often as the epiglottis or ventricular bands.* The records of the post-mortem room show that in 27 per cent. of all cases the edges of the cords, the arytenoid region, and the interarytenoid region are the situations selected,† and the order of frequency is generally (1) the arytenoids, (2) the interarytenoid region, (3) the vocal cords, (4) the ventricular bands, (5) the epiglottis.

Ulceration is most common on the vocal cords, and least frequently seen in the arytenoids. The ventricular bands, the interarytenoid region, and the epiglottis come midway in this respect, and may present infiltration, with or without ulceration.

Earliest physical signs.—One of the most striking is anæmia of the palate and larynx. It may give a waxy look to the whole region, or may be most noticeable in the outstanding epiglottis and arytenoid. It is not constant, and in men may be replaced by a chronic hyperæmia. It is particularly suggestive when not accompanied by general symptoms of anæmia or chlorosis. (Plate xv., Fig. 5, facing p. 468, and Plate XXI., Fig. 2, p. 648.)

In some cases limited patches of hyperæmia, occasionally transitory, should arouse suspicion in a patient with any general symptoms. Catarrh or congestion, limited to one part of the larynx, and lasting some time, should lead to a thorough investigation, for a simple catarrh is, as a rule, bilateral and more or less symmetrical. Hence careful inspection would be directed to any roughness or velvety appearance of the interarytenoid region, thickening or congestion of one arytenoid, of one ary-epiglottic fold, or one side of the epiglottis. If one cord is rounded, or has lost its mother-of-pearl polish, or appears to be encroached on by the ventricular band, or flags in movement, there is ground for suspicion.

Paresis of the muscles of adduction and tension may be among the earliest signs (Plate xv., Fig. 5, facing p. 468). This, if bilateral, would produce the same appearances as functional aphonia (Fig. 255, p. 554); and, as this latter affection is common among the anæmic and tired, it is important to remember the possibility of early tuberculosis.

Interarytenoid region.—In slightly more marked cases this area is generally invaded. A tubercular deposit may take place without any symptoms, or with only a slight change in the timbre of the voice (Plate XXI., Fig. 2, facing p. 648). It may assume the form of a central mound which, owing to compression during phonation, is frequently divided by a central cleft. Or the deposit may take place in several papilliform points (Plate

* R. Lake, "Laryngeal Phthisis," p. 19. London, 1901.

† S. H. Habershon, *Journ. of Laryngol.*, Dec., 1905.

xxi., Fig. 1, facing p. 648). These polypoid excrescences may be soft and of slight consistence, or firm and hard. They may remain for a long time, even for years, without visible change or tendency to ulceration.

It was first pointed out by Stoerk that this interarytenoid infiltration was almost pathognomonic of tubercle. A deposit of hypertrophic laryngitis may also occur in this area, but the infiltration of tubercle looks softer, paler, and more catarrhal, and is frequently associated with ulceration. This may occur first as one or more ill-defined erosions between the mounds, but, as they spread, the infiltration breaks down, and the whole area may become ulcerated (Plate xxi., Fig. 3, facing p. 648). The ulcer may be hidden below the level of a cushion of deposit, and only come into view when the Killian position (p. 41) is adopted. It is usually shallow, indolent, with irregular floor and margin and little secretion. In advanced cases it may be replaced by a red, granulating, suppurating mass, at the bottom of which a yellow, calcareous sequestrum is sometimes detected.

The area in front of the arytenoid is a favourite site for the deposit of tubercle (Fig. 275). A limited, mound-like deposit may take place on the laryngeal surface. In favourable cases this may disappear by a sort of molecular necrosis, and heal up, or it may break down into a circular or oval ulcer not unlike a tonsure, surrounded by a shallow collarette of infiltration. Tuberculous deposit in this region is very commonly associated with changes in the contiguous interarytenoid region and the posterior part of the cord.

The **arytenoids** are so well provided with lax submucous tissue that swelling readily occurs in them (Plate xxi., Fig. 5, facing p. 648). The outline of the arytenoid eminence gradually disappears in a smooth, uniform enlargement, shading off into the ary-epiglottic fold, and so producing the characteristic pear-shaped swellings, which may be red and fleshy, or purplish, or an anæmic pink (Plate xxi., Fig. 4, facing p. 648). The swelling may look tense and shiny, as if distended with fluid, so that it is often described as œdematous. But there is, really, no œdema in this chronic infiltration, which should be called pseudo-œdema to distinguish it from the true œdema that may sometimes occur in this disease (*see* p. 644). Both arytenoids may be affected, and to such a degree that the pyriform swellings meet in the middle line and overhang the glottis (Plate xxi., Fig. 4, facing p. 648). Ulceration is seldom met with, and only late in the disease.

The ary-epiglottic folds in health are thin membranous folds, and any unsymmetrical infiltration requires attention. It is generally uniform, most marked at the arytenoid end, and tends

to invade the ventricular band. The pharyngeal surface is also affected, so that the sinus pyriformis is encroached on. Ulceration is most commonly seen on the inner (laryngeal) surface and at the arytenoid end of the fold.

Vocal cords.—Owing to the close adhesion of the epithelium to underlying elastic and muscular tissue, and the scarcity of sub-mucous and connective tissue, simple infiltration is rarely met with, and white, polished, intact vocal cords may be found in cases showing undoubted deposit in the ventricular bands and arytenoid region. Still it does take place, generally in the posterior or middle segment of the cord. A red, granular state of the cords, as if dusted with red pepper (*chorditis granulosa* of Lake), may be met with (Plate XXI., Fig. 1, facing p. 648). The cord may assume a succulent look and soda-water-bottle shape, while it loses its polish and becomes dull greyish or dusky pink. A fringe of granulations may lie along the attached border, apparently projecting from the ventricle of Morgagni (Plate XXI., Fig. 1). Irregular leashes of vessels appear, and the flat, ribbon-like surface becomes rounded and the free edge sinuous. There is often a want of tension in the cord during phonation, and the sound emitted may be cracked and uneven (Plate xv., Fig. 5, facing p. 468).

Ulcers on the cords are difficult to recognize, as their edges gradually fade into the surrounding healthy tissue, which is not so very different in colour. They are superficial, irregular, and ill-defined (Plate XXI., Fig. 1). When more advanced they are recognized by their irregular, dirty-grey surface and more distinct edges (Plate XXI., Figs. 1, 3, and 5). Single erosions are frequent over the vocal process, and ulcers on the cords are more common over the posterior half; they are generally multiple, tend to become confluent, are often limited to one cord at first, but are frequently bilateral. A series of erosions along the free margin gives a serrated, mouse-eaten appearance to the cord. Sometimes one long ulcer will give it a bifid look.

Vegetations spring up from the ulcers, so that the original form of the vocal cords is quite lost, and the glottic space is much encroached on. When these vegetations become coated with thick, adherent sputum, respiration may become alarmingly embarrassed. But this ceases as the granulations break down, and then the deceptive symptoms of improvement are really due to the more complete destruction of the vocal cords.

The ventricular bands.—According to some observers, infiltration of the false cords is very common, and one of the earliest manifestations of laryngeal tuberculosis.* It possibly escapes

* Gouguenheim and Tissier, "Phthisie Laryngée," p. 43. Paris, 1889.

easy detection because the earliest deposit is concealed in the ventricle of Morgagni. The first manifestation may be evident along the free border of the ventricular band, either primarily or with some arytenoid tumefaction, while the cords remain intact or only superficially abraded. It may take the form of an intumescence overhanging the cord, which then appears narrowed. It is more marked posteriorly, and in advanced cases the cord may be entirely concealed. In other cases a fringe of pink granulations may be seen projecting from the ventricle of Morgagni and overlapping the attached margin of the cord. These appearances agree with the pathological researches of Jobson Horne, who has shown that the tubercle bacillus frequently lingers in this cul-de-sac.* With further deposit the surface of the ventricular band becomes irregular and bulging, and as the two sides are not symmetrical the vestibule of the larynx may look deformed and narrowed. Ulceration is common in later stages, and though it goes deeply it seldom reaches the thyroid cartilage.

The **epiglottis** is one of the regions of the larynx least frequently invaded by tuberculosis in its early stage, and it is seldom isolated there; still, it may occur in relatively early cases, in young subjects with good general health, and with slight symptoms in the chest. It is usually in pulmonary cases of some standing that disease of the epiglottis is met with; indeed, it has been found involved in 59 out of 100 post-mortems of pulmonary tuberculosis. A practical corollary of this statement is that over half the dying consumptives will need relief from the pain they suffer in swallowing (Fetterhoff). In the early stage of infiltration the patient may only complain of a sensation of "something in the throat"; the voice may be unaltered, or there may be a change in timbre, and an effort in using it which physical symptoms seem hardly adequate to explain. Later on, dysphagia becomes marked and even acute, and the voice is thick and woolly. The first physical signs may consist in slight changes in the colour or mobility of the epiglottis (Plate XXI., Fig. 5, facing p. 648). Then the ordinary pink, smooth, glistening surface becomes velvety, congested, and deep red (Plate XXI., Fig. 4). The infiltration may be limited to the lingual surface, or localized in a limited deposit, the most favourable form. Sometimes the free margin escapes and an ulcerating deposit is formed on the laryngeal surface, in the region of the petiolus, just above the anterior commissure (Fig. 276, p. 643). This is a chronic form, and may remain limited. But deposit in the epiglottis is apt to be more or less uniform, so

* *Journ. of Laryngol.*, xvi., 1901, No. 6, p. 275.

Proc. Laryngol. Soc., London, June 8, 1898, p. 99.

that the glosso-epiglottic folds are lost in a general infiltration, the whole epiglottis is swollen to several times its ordinary volume, and becomes a thick, red, ungainly, tense mass, which stands upright (instead of overhanging the tongue), and may even hang back over the larynx. The lateral parts may curve round until they nearly meet and conceal the vestibule of the larynx. This smooth, tense, shiny mass has been variously compared to a turban, a phimosis, a paraphimosis, or the os uteri. Its movements in respiration, phonation, and deglutition are diminished or abolished (Plate xv., Fig. 6, facing p. 468).

Ulceration takes place, generally along the margin. It may start soon after the deposit of tubercle forms and before the epiglottis is swollen to the classical "turban" shape. This ulceration may go deeply, generally in the middle line. In less acute cases it is scattered, in superficial, pale, dirty-grey, and indolent patches. The whole of the epiglottis may ulcerate down to an irregular, bleeding, sprouting nodule. Necrosis is exceptional.

Affections of the cartilages.—The arytenoid is the cartilage most commonly affected. Perichondritis rarely attacks the epiglottis.* Perichondritis of the thyroid as a sequela of the disease is rare, but as a primary manifestation of laryngeal tubercle it not uncommonly attacks this cartilage. The cricoid is rarely involved, except in connexion with the crico-arytenoid joint. This is the most frequent site of perichondritis. Primary infection may take place around the joint, being carried to the spot by the blood- and lymph-streams. A pseudo-ankylosis of the joint may cause fixation of the cord in the cadaveric or median position.† The healing and contraction of deposits around both joints may bring about stenosis of the glottis and necessitate tracheotomy.‡ But most commonly the perichondrium is invaded by ulceration spreading inwards from the usual site. The mucous membrane over the arytenoid eminence becomes red, tense, shiny, soft and easily depressed, so forming a pseudo-œdema. A serous pus makes its way out from the distended perichondrium through one or more fistulæ, not always visible, but generally on the inner aspect. The glottis is then bathed in a yellow discharge as the acuteness of the symptoms subsides. The cartilage remains more or less necrosed, and in rare cases has been expectorated *en masse*.

Perichondritis of the thyroid may produce a swelling of the

* Gouguenheim and Tissier, "Phthisie Laryngée," p. 102. Paris, 1889.

† Percy Kidd, *Brit. Med. Journ.*, March 29, 1890, p. 715.

N. Bardswell, *Proc. Roy. Soc. Med.*, Laryngol. Section, vol. iv., Nov., 1910.

‡ StClair Thomson, *Proc. Laryngol. Soc., London*, xiv., Nov., 1906, p. 4.

StClair Thomson, *Proc. Roy. Soc. Med.*, Laryngol. Section, Nov., 1907, p. 5.

ventricular band, if the inner surface is attacked. The purulent collection makes its way into the larynx. The external surface of the thyroid plate may also be affected. A swelling then takes place externally which is not inflamed, and is seldom painful. An incision into it yields pus and leads down to denuded cartilage.

Perichondritis of the thyroid may occur in a chronic form, but it may also be acute and present under the symptoms of acute oedematous laryngitis. As it may be the first manifestation in the larynx, and may occur before physical signs are present in the lungs, the diagnosis is often obscure.

The clinical picture of perichondritis is not always very clear. Intermittent attacks are apt to occur in the course of a chronic infection, and are not always free from anxiety. The symptoms will vary according to the cartilage affected. Pain is generally present, and is increased by pressure from the outside. Dyspnoea may occur suddenly and demand tracheotomy, or it may be intermittent. Dysphagia is apt to be severe (cf. p. 504).

In the **subglottic region** deposit of tubercle may take place as a diffuse infiltration. Ulceration is often an extension from that going on in the interarytenoid space and the posterior ends of the cords. The granulation tissue in the subglottic area may project on each side during phonation so as to give the semblance of two supplementary inferior vocal cords.

The trachea.—In advanced cases tuberculosis not uncommonly develops in the trachea. Thus, in the post-mortem examination of 1,255 cases of pulmonary tuberculosis, while the larynx was diseased in 595 cases (47·41 per cent.), tracheal ulceration occurred as a part of tuberculous laryngitis in 130 cases (10·35 per cent.). It is possible, though uncommon, for the trachea to be extensively ulcerated, while the vocal cords and supraglottic region are quite free from tubercular disease.* In 2 cases only, the trachea alone was affected (0·16 per cent.). Bronchial ulceration occurred in 53 cases (4·22 per cent.), but never without concomitant laryngeal disease.†

The disease is rare on the anterior section, and prefers the membranous portion of the tube. Ulceration takes place not only here, but also between the rings of the trachea, and at the junction of the cartilaginous and membranous portions.‡ These ulcers are apt to be serpiginous, they may be small or extensive, and are often covered with granulations. Tuberculomata, or papilloma-like

* St. Bartholomew's Hosp. Mus., Nos. 1633f, 1633f¹, 1633f².

† S. H. Habershon, *Journ. of Laryngol.*, Dec., 1905.

‡ Gouguenheim and Tissier, *loc. cit.*

growths, may also occur.* Tuberculosis may, very rarely, appear to be primary in the trachea, even producing stenosis.†

The disease is generally too extensive for any possibility of arrest.

In connexion with tuberculosis of the larynx, there remain to be considered (1) tuberculous tumours, (2) stenosis, and (3) œdema.

1. A tuberculoma is a rare form of infection in the larynx.‡ A certain number of cases have been described in which the characteristic histological structures have been discovered in a small, pale, indolent, and generally sessile tumour. Careful inspection will often reveal a commencing tuberculous ulceration in some other part of the larynx (Fig. 276).



Fig. 276.—Tuberculoma of the larynx.

The condition would be difficult to diagnose from inspection alone during ordinary respiration; but phonation brings into view the lower part of the epiglottis, which is characteristically infiltrated and ulcerated.

2. Stenosis of the larynx from tuberculosis may be permanent and mechanical, due to (a) lesions of the mucosa and submucosa, (b) affections of the cartilages and joints, or (c) neuropathic processes.

(a) The stenosis may be caused by tumour formation (Plate xv., Fig. 6, facing p. 468), or by fungating granulations directly occluding the glottis. As the stenosis generally occurs slowly,

* J. N. Mackenzie, *Arch. of Med.*, N.Y., Oct. 1, 1882, Art. 1.

† Schrötter, *Deut. med. Woch.*, Juli 11, 1901.

‡ J. N. Mackenzie, *Arch. of Med.*, N.Y., Oct. 1, 1882, Art. 1.

J. N. Mackenzie, *Journ. of Laryngol.*, Aug., 1907, p. 379.

Schnitzler, *Wien. med. Presse*, April, 1883.

Percy Kidd, *Med. Times*, Aug. 26, 1884.

Avellis, *Deut. med. Woch.*, 1891, Nos. 32 and 33.

Gottfried Trautmann, *Arch. f. Laryngol.*, Bd. xii.

A. Bronner, *Proc. Laryngol. Soc., London*, iv., Dec., 1896, p. 30.

Atwood Thorne, *ibid.*, Feb., 1904.

H. Tilley, *ibid.*

C. F. Theisen, *Trans. Amer. Laryngol. Assoc.*, 1903, p. 104.

J. Payson Clark, *Amer. Journ. of Med. Sci.*, cix., May, 1895.

L. Neufeld, *Rev. Hebdom. de Laryngol.*, xxii., 1901, No. 38, p. 358.

the symptoms are seldom threatening, and generally yield with the progress of ulceration or under treatment. A period of some dyspnoea, particularly on exertion, may thus be followed by relief.

The stenosis induced by œdema, to be described presently, is, on the contrary, apt to be sudden and alarming.

The large swelling of perichondritis may cause mechanical obstruction of the larynx.

(b) Laryngeal tuberculosis may produce stenosis by fixing the cords, and so simulating abductor paralysis. This may be the result of three different conditions: (1) plastic infiltration around the arytenoid joint, leading to adhesive perichondritis and spurious ankylosis; (2) ulceration followed by scarring and the formation of a web,* or fixation of the joint in adduction, so that tracheotomy is required;† or (3) suppurative crico-arytenoid arthritis.‡

(c) Laryngeal stenosis may be due to the effect of tuberculosis outside the larynx, causing pressure on the recurrent laryngeal nerve. Thus on the right side the nerve may be implicated in pleuritic thickening of the apex of the lung, while on the left side the recurrent, in its longer course, is more apt to be compressed by enlarged bronchial glands as it winds round the arch of the aorta.

3. **Œdema of the larynx** is less frequently met with than the pseudo-œdema already described (p. 638). True œdema occurring in the last stages of phthisis is nearly always persistent. But when the disease is less advanced, inflammatory œdema may supervene in lesions that are not very extensive. It may develop suddenly, without any preliminary symptoms, and even in patients who have no suspicion that they are tubercular subjects. The sudden stenosis may prove rapidly fatal,§ or the œdema may undergo considerable absorption and may even disappear completely, suddenly, and spontaneously.

Pathology and histology.—The tubercular process may be manifested within the larynx by infiltration, ulceration, tuberculoma, miliary tubercle, true œdema, and cicatrices.

Opportunity seldom offers for investigating the early stages of tuberculosis in the larynx, but the process follows an evolution similar to that in other parts (Jobson Horne). Tubercles are relatively rare in the larynx, and the special characteristics in this organ are the diffusion of the lesions, and the tendency to infiltration and sclerosis. Hence, in cases not very advanced, we may find no tubercular foci but only a sclerotic tissue infiltrated with round cells. This may explain why Heinze's post-mortem examinations showed tubercular infiltration most frequently in the ventricular bands—a region

* S. Rosenheim, *Laryngoscope*, Sept., 1906, p. 732.

Solis-Cohen, *Internat. Journ. of Med. Sci.*, 1888, p. 517.

† StClair Thomson, *Proc. Laryngol. Soc.*, London, xiv., 1906, Nov., p. 4.

StClair Thomson, *Proc. Roy. Soc. Med.*, Laryngol. Section, Nov., 1907, p. 9.

‡ Percy Kidd, *Brit. Med. Journ.*, March 29, 1890, p. 715.

§ Logan Turner, *Proc. Laryngol. Soc.*, London, vii., 1900, May 5, p. 97.

which is not a favourite site clinically.* The small papillary thickenings in the neighbourhood of the cords and interarytenoid space are made up of thickenings of the epithelial layer, or of hard, fibrous, and poorly vascularized tissue. These hypertrophies may not show tubercles (Kundrat), nor tubercle bacilli (Grünwald), nor positive inoculation results, and yet may undoubtedly be caused by tuberculosis. As pointed out, the so-called "œdema" is often found post-mortem to be not œdema, but a soft or even sclerotic infiltration.

Diagnosis.—The diagnosis of laryngeal tuberculosis is not only important on account of the local condition, but also because the laryngoscope can sometimes settle the diagnosis of some uncertain pulmonary infection, and will always prove valuable in forming a prognosis in tuberculosis of the lungs. In a large proportion of cases the appearances described are sufficient to enable a diagnosis to be made from inspection only. Sometimes early symptoms can only be regarded as suspicious until the laryngeal evidence is supported by proof of tuberculosis elsewhere. In other instances the supporting evidence can only be gained by the progress of the case—the gradual increase of laryngeal changes, with the slow evolution of early general symptoms (p. 635). The conclusive evidences of tubercle bacilli should not be waited for; they are not present in all cases. When seeking confirmatory evidence in the lungs it is well to remember that the presence of laryngeal disease may alter the physical signs in the chest, generally in the direction of minimizing them.

The injection of tuberculin for diagnostic purposes has a somewhat restricted value. The absence of any reaction does not exclude tubercular disease; a focal reaction might warrant a positive diagnosis.†

Simple laryngitis, if intractable, and not explained by any chronic condition of the pharynx or nose, if unilateral or more marked on one side than the other, if associated with any ulcer or unilateral deposit, and if accompanied by any suspicious general symptoms (p. 635), should suggest the possibility of tubercle. Any abrasion or infiltration in the arytenoid region is strongly suspicious of tubercle.

Pachydermia laryngis is limited to the posterior extremity of the cords, but it is firmer, more symmetrical, and has a more characteristic appearance (p. 499). The local discomfort is less, and general symptoms are absent.

In leprosy the skin and nasal chambers are always affected first. Deposit takes place in round, firm, fleshy knobs. Ulceration occurs late. There is no pain. The chief symptoms are hoarseness and, later on, dysphagia.

* Heinze, *loc. cit.*

† Noel Bardswell, *Lancet*, Jan. 9, 1915, p. 68.

With regard to syphilis, there is no difficulty in distinguishing tuberculosis from secondary syphilis, or a simple gumma, but with ulcerating syphilis the task is not so easy. As to site, the epiglottis is rarely attacked primarily by tuberculosis, and then it is particularly on its laryngeal surface. Syphilis, on the contrary, has a marked predilection for the epiglottis on its lingual surface. In the arytenoid region a gumma is often single and unilateral. Syphilis is more common than tubercle on the anterior part of the cords, although by no means rare in the neighbourhood of the processus vocales. The character of the lesions is different. Syphilitic ulcers are surrounded by distinctly congested or inflamed tumefaction, and not by the indeterminate, pale, shallow, chronic thickening of tubercle. The edges of a syphilitic ulcer are definite, distinctly punched-out or undermined, and fleshy, and the floor of the ulcer is dirty grey, coated with thick adherent pus or irregular necrotic tissue, and shows little tendency to granulate. The edges of the tubercular ulcer are irregular, mouse-nibbled, and yellowish, while the floor is shallow, granulating, and coated with much mucus and little, easily detached pus. The syphilitic ulcer is more limited than the indefinite tubercular ulcer; it is prone to extend in depth rather than in surface; it appears more active, and may lead to rapid destruction, with dense cicatrization and consequent stenosis. The syphilitic voice is raucous, and generally strong and painless. That of tubercular laryngitis is hollow, low, and weak. Pain is generally less marked in syphilitic cases, unless there is a rapidly breaking-down gumma on the epiglottis or arytenoid. A long-standing history of laryngeal trouble, particularly if associated with extensive local disease and slight general symptoms, is more indicative of syphilis. The administration of iodide of potassium frequently aggravates tuberculosis of the larynx, and may produce oedema. It generally improves a syphilitic lesion. The two processes may be present in the same larynx, or may succeed one another; hence a Wassermann reaction, though helpful, is not always conclusive. (Fig. 277.)

The differential diagnosis from lupus has been described at p. 626.

Benign neoplasms are rare in the posterior half of the larynx. Their appearance is characteristic. In the case of a tuberculoma, a microscopic examination may be required to settle the diagnosis. In middle-aged or elderly men a tuberculous deposit, in the absence of confirmatory symptoms, may simulate a malignant growth. The detection of an ulcer in some part of the larynx, the onset of general symptoms, or the evidence of the microscope, will assist in settling the diagnosis (Plate xv., Fig. 6, facing p. 468).

Prognosis.—In 1880 Morell Mackenzie stated that “the prognosis of laryngeal phthisis is always extremely unfavourable, and it is not certain that any cases ever recover.” The general progress of medicine and the great advance made in the treatment of pulmonary tuberculosis enable us to take a somewhat less gloomy view; but that tuberculous laryngitis still remains a very serious complication is shown by the universal reluctance with which cases are admitted to sanatoria. Mackenzie’s statistics showed that troublesome throat symptoms reduced the average expectancy of life to twelve or eighteen months, very few patients living more than two and a half years. Nowadays it is not uncommon to see patients with marked laryngeal lesions living fairly comfortably for five and more years. As this frequently takes place in the absence of any local treatment, it is a striking evidence of the advance made in the principles of treating tuberculosis. These modern methods permit of more spontaneous arrests of the disease in the larynx, and enable us to add considerably to their number by judicious local treatment.

Prognosis in the first instance will chiefly depend on the virulence, extent, and progress of the pulmonary lesion, and the reaction of the individual; and, in the second place, on the situation, extent, depth, age, and progress of the laryngeal disease. Extensive or old-standing pulmonary disease is, of course, of evil omen, and so are rapid pulse, persistent elevation of temperature even with rest, anorexia, dysphagia, loss of weight, want of moral vigour, pregnancy, or a bad family history. It is generally recognized that the more a patient is over 40 years of age the better is the outlook. Syphilis makes the prognosis worse, not only because of its general effects, but because of the inveterate nature of tertiary disease in the larynx, its tendency to stenosis, and the fact that tubercular patients are bad subjects for iodide of potassium or mercury.

As regards the local lesions, the most promising are infiltration in the interarytenoid region and the area in front of the arytenoids, or superficial ulcers of the cords (Plate XXI., Figs. 1 and 2, facing p. 648). Papillary outgrowths in these regions are also curable. Localized and chronic infiltration in the epiglottis and ary-epiglottic fold may prove amenable, and also infiltration with ulceration of the ventricular band (Plate XXI., Fig. 3). When the epiglottis alone is involved a cure is possible. Cure cannot be expected if the local process is acutely progressive, particularly if it involves the greater part of both sides or both arytenoids with persistent pseudo-œdema, or the epiglottis together with other areas. Perichondritis is seldom

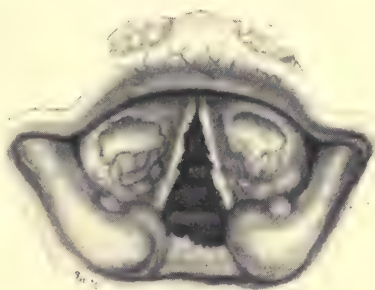


Fig. 277.—Combined tuberculosis and syphilis of the larynx.

Note the syphilitic deposits in the epiglottis and clear-cut ulcerations on the ventricular bands, together with the tuberculous ulceration of the vocal cords and interarytenoid space. There were moist sounds at one apex, tubercle bacilli were present in the sputum, and the Wassermann reaction was positive.

recovered from, but if it is limited to the thyroid cartilage, and points externally, recovery is possible.

Early diagnosed cases in private practice, or in a sanatorium, will always yield better results than those in which the laryngeal lesion has advanced so far that the patients apply in the first instance to a throat clinic. Sanatorium statistics may show arrest in 20 per cent. of favourable cases.*

That complete and lasting cure is possible is shown not only by demonstration of well-marked cases, but also by post-mortem examination.†

The prognosis is good as regards the voice, if the disease can be arrested. Even after extensive destruction of a cord a new, cicatricial, and very serviceable cord is formed.‡ Cicatricial contraction is seldom met with, but I have shown two completely arrested cases of extensive disease in which the scarring led to such close approximation of the cords that a tracheotomy tube has to be permanently worn.§

Sudden death from asphyxia.—Though often feared, this rarely occurs. Obstruction is generally so gradual that the onset of stridor, as well as laryngoscopic examination, gives sufficient warning of the necessity of tracheotomy. Sudden death from glottic spasm has been recorded, but is rare.|| Acute œdema is also a rare but possible occurrence.¶

It is often said that consumptives never die from the larynx; and it is noteworthy that, however distressing the laryngeal symptoms may be, death is generally caused by the pulmonary condition. But the saying is not absolutely true. Tuberculous laryngitis may, though rarely, cause sudden asphyxia, and indirectly it precipitates a fatal termination by dysphagia and starvation, and by the mental depression and anxiety it is so apt to cause.

Treatment.—Treatment may be directed (1) to obtaining complete arrest of the tubercular infection, pulmonary and laryngeal, (2) to curing it in the larynx, and (3) to relieving symptoms.

The question of climate is best decided by consideration of the patient's general and pulmonary condition, remembering that it is more important how a patient lives than where he lives. The best climate without care is not likely to be so beneficial as an indifferent climate with the best of other advantages. There is no foundation for the objection to high altitudes for laryngeal tuberculosis, if mountain air is not otherwise contra-indicated by the presence of fever, tachycardia, hæmoptysis, and so forth.**

The case must always be viewed as one of pulmonary origin,

* StClair Thomson, *Brit. Med. Journ.*, April 11, 1914.

† Heryng, *Journ. of Laryngol.*, 1893.

‡ StClair Thomson, *Proc. Laryngol. Soc., London*, xiv., 1906-7, p. 102.

§ *Ibid.*, Nov., 1906.

Solis-Cohen, *Internat. Journ. Med. Sci.*, 1888, p. 517.

|| Massier, *Arch. Internat. de Laryngol.*, xviii., 1904, No. 5.

¶ Logan Turner, *Edin. Med. Journ.*, May, 1902.

** Tecon, *Schweizer Rundschau*, Jan. 24, 1914; and *Brit. Med. Journ. Epitome*, March 28, 1914, p. 51.

TUBERCULOSIS OF THE LARYNX

Fig. 1.—Tubercular infiltration of interarytenoid region, and of both arytenoids, particularly the left. Both vocal cords are infiltrated, and there is ulceration of the free margin of the left cord, in its posterior third.

Fig. 2.—Early tuberculous laryngitis. There is general anæmia of the larynx. In the interarytenoid region there is a mammillated infiltration, and its irregular surface is beginning to ulcerate. (*See* p. 637.)

Fig. 3.—Marked infiltration of the left ventricular band, which almost hides the ulcerated vocal cord on that side. Ulcerated infiltration of the interarytenoid region. Nodular infiltration of right cord.

Fig. 4.—Pseudo-œdema of epiglottis and both arytenoids, preventing any view of the interior of the larynx.

Fig. 5.—Case of rapidly progressive tuberculosis of larynx. Infiltration of both ventricular bands; ulceration and destruction of both vocal cords; subglottic infiltration on right side; infiltration of both arytenoids, and œdema over the right, indicating acute perichondritis of the right crico-arytenoid joint.

Fig. 6.—Miliary tubercles on epiglottis. Marked infiltration and acute œdema of epiglottis and both arytenoids. This patient developed tuberculosis while under observation for nasal sinus disease, and died in three months.

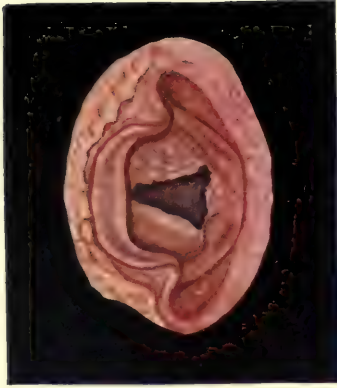


PLATE XXI.

with laryngeal extension and general symptoms. The general care and hygiene of the patient is therefore of primary importance. It is best carried out in an open-air sanatorium. When this is impossible, the principles of diet, rest, exercise, constant exposure to unvitiated air, and regular medical supervision should be adhered to. Tobacco and alcohol must be abandoned, and sudden exertion, as well as games and violent exercises, should be given up. When an abundant and fat-forming diet, with a regular open-air existence is not possible, such foods as cod-liver oil and maltine must be given, while arsenic or some creosote preparation may be prescribed, and wide-open windows are insisted upon, at least at night. Under this general treatment and the relief of symptoms, some cases of early laryngeal disease will heal spontaneously. This will be further promoted by rest to the larynx, best secured by complete silence.* Rest is particularly valuable in the early stage, on the first efflorescence of laryngeal lesions. Under its influence an abraded ulceration of one cord may heal up in two months.† Sometimes six months of strict silence are required. If the local symptoms have not then subsided, it is generally unnecessary to persevere with absolute silence, and some local measures are generally called for. Yet in all stages, even in hopeless cases, the larynx remains cleaner and more comfortable if talking is reduced to a minimum, and the patient is encouraged to suppress his cough as much as possible.

The larynx is relieved of catarrh by the use of cleansing alkaline lotions (*see* p. 61, and Formulæ 9 and 31), and is soothed by sprays of liquid vaseline, containing menthol, chloretone, and antiseptic oils (Formulæ 66 and 69). Local cough and irritation may be checked by such simple lozenges as glycerin, carbolic, menthol, liquorice, or lemon; or those containing codeia (gr. $\frac{1}{8}$ – $\frac{1}{4}$), heroin (gr. $\frac{1}{12}$), morphia (gr. $\frac{1}{40}$ – $\frac{1}{12}$), or cocaine (gr. $\frac{1}{10}$) may be employed; but all such sedatives should be avoided, if possible, as they are apt to lose their effect and only destroy the appetite.

Pain and dysphagia will frequently subside under vocal rest and suitable diet. The food should be soft or well masticated; abundance of milk, cream, butter, and eggs is desirable, and can be introduced in purées of spinach, potatoes, chicken, and so forth. The pain of deglutition can sometimes be relieved by getting an assistant to stand behind the patient and make firm and even pressure at the angle of each jaw at the moment of swallowing.

* StClair Thomson, *Trans. Internat. Congr. of Tuber. of 1901*, London, vol. iii., p. 356.

† StClair Thomson, *Proc. Roy. Soc. Med.*, iii., Nov., 1909, p. 6.

Or Wolfenden's position may be adopted: the patient lies prone on a couch, with the face over the end, and sucks the nourishment through a glass tube from a cup on the floor. Relief to dysphagia may also be obtained by a laryngeal insufflation of 3-5 gr. of orthoform or anæsthesin (pp. 63 and 805). If given an hour before the chief meal of the day, it may furnish twenty-four hours' comfort (Formulæ 23 to 26). It is only effective when there is ulceration. Pain may also be alleviated by injections of alcohol or novocaine into the superior laryngeal nerve.* (See description of technique, p. 77.)

Sprays of cocaine (2 per cent.) and insufflations of morphine (gr. $\frac{1}{16}$ - $\frac{1}{4}$, with gr. ii of starch) should be reserved for hopeless cases.

Dyspnoea, from stenosis, will frequently subside with strict local and general rest. When stridor becomes marked, interfering with sleep, rest, or circulation, a median tracheotomy is carried out under local anæsthesia (p. 775). Local infection of the tracheotomy wound is a complication to be feared in progressive cases.

Perichondritis and tubercular abscesses in the neck are, of course, opened from the outside.

Local treatment. *Sprays.*—The local catarrh and suppuration are relieved by cleansing alkaline sprays (p. 61).

Insufflations.—Attempts at local antiseptis by the insufflation of powders (iodoform, eucrophen, formidine, dermatol, or aristol) are fruitless and may only cause irritation.

Intratracheal injections.—These (Formulæ 66 and 68) may at times alleviate in the cases where good hygiene, diet, and rest are unattainable † (cf. p. 592).

Inhalations.—Equally good results, and without the irritating drawbacks, can be secured by the much pleasanter method of constantly wearing the perforated zinc inhaler of Burney Yeo, moistened with a volatile antiseptic (Formulæ 19, 21, and 22).‡ Chlorotone can be sublimed in a glass tube similar to that used for calomel fumigations (Fig. 289, p. 703), and then blown into the larynx. It is antiseptic, and a useful analgesic.§ Steam inhalations should be avoided, except for the treatment of intercurrent attacks of acute laryngitis or perichondritis.

Pigments.—For ulcers covered with dirty grey sloughs, Heryng recommends painting with a freshly made saturated solution

* Dundas Grant, *Lancet*, June 25, 1910; and *Journ. of Laryngol.*, xxvi., 1911, No. 11, p. 561.

† J. Walker Downie, "Diseases of the Throat," p. 305. Glasgow, 1909.

‡ Robinson, *Amer. Journ. Med. Sci.*, Aug., 1908. (Epitome in *Brit. Med. Journ.*, Dec. 5, 1908.)

§ Sylvestre Proust, Thèse de Paris, 1908.

of permanganate of potash.* Of local escharotics the favourite one is lactic acid,† as its beneficial action is said to lie in its power of attacking the morbid tissue, while leaving healthy parts intact. It is unavailing except in strengths of 50 per cent. or more. Hence sprays of 2 per cent. are nothing but irritating. Frequent applications are also irrational, the object being to produce an eschar which does not separate for one to three weeks. When the slough is detached, a healing ulcer is exposed; but there are generally deeper deposits requiring a repetition of the cauterizing process, so that four to twelve applications may have to be spread over as many months. Lake recommends a pigment made of formalin 7 per cent., pure carbolic acid 10 per cent., and lactic acid 50 per cent. Formalin alone has also been recommended; and chromic acid fused on a probe is effective. These caustics, of course, require complete cocaineization (p. 71).

As to indications, it is worse than useless to apply burning escharotics over unbroken infiltrations. They may prove serviceable on ulcerated surfaces of limited extent, on the cords or the posterior wall. Over large areas a caustic pigment is of doubtful benefit. I have entirely abandoned all chemical caustics.

Curetting.—It does not seem justifiable to remove tuberculous deposits lying below an intact epithelium in order to create an ulcerating surface which can then be treated by escharotics. But the curette and punch-forceps are serviceable in removing broken-down, granulating, or fungating areas. This is perhaps most frequently called for when the false or true vocal cords, the posterior wall, or the epiglottis are affected. The punch and curette can be used with indirect or direct laryngoscopy (p. 46), but suspension laryngoscopy is even more convenient, as it leaves both hands free for manipulation (p. 49). If the case is not acute and progressive, a complete cure may be obtained; and, even in a hopeless case, the relief of dysphagia which is effected by amputating an infiltrated and ulcerating epiglottis is sometimes remarkable.‡

Galvano-cautery.—The galvano-cautery is, in expert hands, a valuable method of cure.§ Its beneficial action does not depend so much on the amount of diseased tissue destroyed, as on the local antiseptic action, and the stimulation of reaction and of limiting fibrosis.|| It is therefore suitable for deposits, as well as for ulcerating surfaces, and it can be employed for the destruction of granulating

* *Ann. des Mal. de l'Oreille*, xxxiv., 1898, No. 11, p. 497.

† H. Krause. *Berl. klin. Woch.*, 1885.

‡ Lorenzo Lockard, *Trans. Amer. Laryngol. Assoc.*, xxxiii., 1911, p. 29.

§ Mermod, *Arch. Internat. de Laryngol.*, xviii., 1904, No. 6, p. 752.

|| L. Grünwald, *Rev. Hebdomadaire de Laryngol.*, xxiv., 1903, No. 42, p. 470.

L. Grünwald, *Journ. of Laryngol.*, xx., 1905, No. 12, p. 637.

|| George B. Wood, *Trans. Amer. Laryngol. Assoc.*, xxxiii., 1911, p. 181.

and fungating surfaces. I prefer it for all cases where rest and hygiene do not promise a spontaneous cure, and where the laryngeal and general criteria of prognosis warrant local treatment.

Under cocaine a fine-pointed electrode, brought almost to a white heat, is firmly thrust through the diseased area until its arrest shows that healthy tissue has been reached. Several cauterizations are carried out at one sitting, which is repeated every twenty to thirty days until complete healing takes place. (Fig. 278.) The cautery can also be well used with direct laryngoscopy (p. 46), which is particularly helpful when the posterior commissure requires treatment. This method, in my hands, has greatly reduced

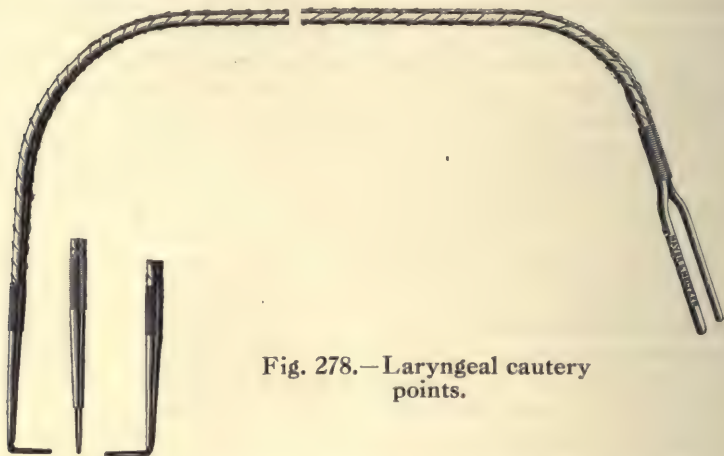


Fig. 278.—Laryngeal cautery points.

the number of cases requiring the curette, and, in common with many others,* I have quite abandoned the use of lactic acid.

Tracheotomy.—As a curative remedy tracheotomy is rarely employed nowadays. Strict silence will secure almost as complete rest to the larynx. It is required in cases of increasing or established stenosis, but a threatening indication for it will often disappear when the fungating granulations which obstruct the glottis break down. Tracheotomy may be required in healed cases where the cicatricial contraction has produced stenosis (p. 574).

Thyrotomy (laryngo-fissure) has effected a cure in a few cases.†

* Freudenthal, *Journ. Amer. Med. Assoc.*, March 16, 1901.

Maget and Plauté, *Ann. des Mal. de l'Oreille*, xxix., 1903, No. 6, p. 501.

† Otto J. Stein, *Laryngoscope*, Oct., 1904.

Lambert Lack, *Proc. Laryngol. Soc., London*, ix., April, 1902, p. 99.

Harold Barwell, *Proc. Roy. Soc. Med., Laryngol. Sect.*, iii., Nov., 1907, p. 7.

H. Tilley, *Brit. Med. Journ.*, 1907, ii.

Felix Semon, *XVI' Cong. Internat. de Méd.*, Budapest, 1909, Section xv., 1er fasc., p. 1.

In the majority it has only hastened a fatal termination. The wound in the neck is very apt to get infected with tubercle. It is no better than tracheotomy in a hopeless case, and as a curative remedy it is seldom justifiable.

Laryngostomy, hemi-laryngectomy, and even *complete excision* of the larynx have been recommended as suitable in tuberculosis of the larynx.* I hardly think the subject calls for much consideration, as the cases must be rare where the pulmonary condition of the patient with such extensive laryngeal disease would warrant these heroic measures.

Indications for or against surgical treatment for laryngeal tuberculosis are thus epitomized by Heryng: † —

Surgical treatment is indicated—

(a) In tubercular tumours of the larynx.

(b) In chronic circumscribed infiltrations, particularly in thickenings on the posterior wall of the larynx which show little tendency to ulceration.

(c) In chronic ulcerations situated on infiltrations and surrounded by granulations which resist every other method of treatment.

(d) In a unilateral affection of the larynx involving the epiglottis, the ventricular band, and the ary-epiglottic fold.

It is contra-indicated—

(a) In cases of advanced pulmonary tuberculosis complicated with fever and cachexia.

(b) In diffuse miliary tuberculosis of the larynx, or of the larynx and pharynx.

(c) Whenever there is cachexia.

(d) In marked stenoses of the larynx caused by inflammatory swellings of the parts affected. In such cases prompt tracheotomy is necessary.

(e) In patients who are timorous, nervous, irritable, suspicious, without energy and confidence, and in all those in whom the general condition gives little promise of cure.

The treatment by *tuberculin injections* is still a much-discussed subject, and readers are referred to current literature.‡ After careful experience of it, in a sanatorium of 100 beds, during a period of five years, I have come to the conclusion that there is no evidence that it results in any decided benefit.§

Treatment of complications.—The coincidence of syphilis in the larynx calls for stricter general treatment in the way of hygiene, diet, and rest. Inunctions of mercury are more effective than iodides.

* T. Gluck and J. Soerensen, *Zeits. f. Laryngol.*, Bd. iv., Heft 3; and *Journ. of Laryngol.*, xxvii., 1912, No. 5, p. 344.

† *Ann. des Mal. de l'Oreille*, xxxiv., 1908, No. 11, p. 497.

‡ W. Camac Wilkinson, *Brit. Med. Journ.*, 1910, ii., Nov. 26, p. 1705.

H. Batty Shaw, *Practitioner*, Dec., 1910.

§ Noel D. Bardswell, "Treatment of Pulmonary Tuberculosis with Tuberculin." London, 1914.

Pregnancy must always be viewed with anxiety. It would generally contra-indicate active local treatment, but tracheotomy may be necessary. The induction of abortion or premature labour is not warranted, as the disease advances just as rapidly when the uterus is emptied as when the pregnancy is not interrupted. Pregnancy is to be avoided in cases of laryngeal tuberculosis, and nursing should be forbidden.*

ACUTE MILIARY TUBERCULOSIS OF THE LARYNX

Acute miliary tuberculosis in the larynx is rare. When it does occur it is seldom limited to the larynx, where it is found on both surfaces of the epiglottis, and its presence is overshadowed by the simultaneous appearance of the disease on the soft palate and uvula (cf. p. 629). Confluent tubercles in the arytenoid region occur at the same time as acute tuberculosis of the pharynx, but they are not so white as in the latter region (Plate XXI., Fig. 6, facing p. 648).

TUBERCULOSIS OF THE ŒSOPHAGUS

Tuberculosis of the œsophagus is rarely recorded.† P. H. S. Hartley found one case with an œsophageal lesion in 263 post-mortem cases of tuberculosis. In Habershon's experience, two cases of œsophageal tubercle were met with in 1,500 necropsies. Tuberculous glands situated below the bifurcation of the trachea may perforate into the œsophagus.‡ This gives rise to a far-spreading abdominal tuberculosis, but there are no symptoms by which the occurrence of the perforation can be diagnosed during life.

* Sokowsky, *Berl. klin. Woch.*, July 4, 1904. (Reference in *Brit. Med. Journ.*, 1904, Aug. 20.)

A. Kuttner, *ibid.*, 1905, Nos. 29 and 30.

A. Kuttner, *Ann. des Mal. de l'Oreille*, xxxiii., 1907, No. 11, p. 445.

G. Barthas, Thèse de Paris, 1907.

C. A. Parker, *Proc. Laryngol. Soc., London*, Feb., 1905, p. 49.

E. Felix, *Ann. des Mal. de l'Oreille*, Fév., 1906, p. 115.

Henrici, *Arch. Internat. de Laryngol.*, xvii., 1904, No. 2, p. 701.

Godskesen, *Rev. Hebd. de Laryngol.*, xxiv., 1903, No. 38, p. 361.

A. Lewy, *Arch. f. Laryngol.*, xv., 1904, p. 114.

† F. C. Shrubsall and W. T. Mullings, *Path. Soc., London*, Jan. 6, 1903.

Lalaguë, *Rev. Hebd. de Laryngol.*, xxv., 1904, No. 13, p. 393.

J. Guisez, *Arch. Internat. de Laryngol.*, March-April, 1910, p. 406.

Lorenzo B. Lockard, *Laryngoscope*, xxiii., 1913, No. 5, p. 561. (A critical review.)

‡ Voelcker, *Path. Soc., London*, 1890.

Clive Riviere, *Brit. Med. Journ.*, Jan. 24, 1903, p. 193.

CHAPTER XLV

SYPHILIS OF THE UPPER AIR-PASSAGES

SYPHILIS of the nose and throat is particularly interesting and important for several reasons. Some of the manifestations of this widespread affection appear in the throat as part of the regular course of the disease; the diagnosis in many cases is decidedly difficult; the symptoms are at times obscure and insidious; the lesions may progress with alarming rapidity; treatment is generally successful, if suitably applied; malignant types are sometimes met with; the disease in these regions may be fraught with serious danger to life; and the sequelæ may involve permanent disfigurement, or grave interference with voice, respiration, and deglutition. It therefore behoves all practitioners to be acquainted with the symptoms of syphilis in this region, since they may be of great importance in helping to diagnose lesions which may appear elsewhere; and, on the other hand, the specialist who is ready to recognize syphilitic manifestations in other parts is better able to settle the doubtful diagnosis of appearances in the nose or throat.

Treatment has in many instances to be promptly and effectively carried out. The treatment of syphilis varies somewhat according to the region of the body in which it appears, and in the upper air-passages this differentiation is often well marked.

Syphilis is analogous to the exanthemata, in that there are eruptions on the skin and mucous membranes, which develop at a certain period after infection. But instead of their developing at the end of two weeks, the period of incubation is generally more nearly ten weeks; and the course of syphilis is counted in years, instead of weeks; its onslaught is less violent; fever is only met with during the skin eruption, and there is difficulty in recognizing any specific catarrh. Like scarlatina and measles, it affects the throat.

The history of infection is deceptive, as it may be absent or be denied. When present, it may be misleading, for a syphilitic subject may very possibly have tuberculosis or malignant disease; and a syphilitic ulcer may become carcinomatous.

The supporting evidence may be defective. Until lately we have had no characteristic proof, like the bacilli of tuberculosis or the microscopic appearances of malignant disease. It seems probable that the detection of the *Spirochæta pallida* and the serum reaction (Wassermann) will, to a large extent, supply this want; but the clinical training of the practitioner will still be the chief factor in the very important matter of diagnosis. The value of the Wassermann reaction is not an absolute one; it is not, by itself, sufficient evidence of syphilis. In a suspected or doubtful case a positive Wassermann reaction is a valuable additional symptom, which, in conjunction with

others, constitutes an important aid to diagnosis. On the other hand, a negative reaction, in the presence of definite symptoms, does not exclude syphilis, while a positive reaction may exist apart from the presence of the infection.* The treatment of syphilis has recently been much improved, both by the introduction of new remedies and by the perfecting of older methods.

SYPHILIS OF THE NOSE

This may appear in the acquired or the hereditary form. Acquired syphilis may attack the nose in the (1) primary, (2) secondary, or (3) tertiary stage of the disease.

PRIMARY SYPHILIS OF THE NOSE

Etiology.—Primary chancre of the external surface of the nose is a matter which is outside the domain of the rhinologist. Primary chancre of the nasal cavity is a very rare affection.† When inoculation through the nose occurs it is generally in the skin of the vestibule, or, more rarely, at the anterior and lower surface of the septum, in fact in that neighbourhood where nose-picking so frequently produces an abrasion on the cartilaginous septum (Fig. 64, p. 112). Medical men may accidentally inoculate themselves here if they do not observe due precaution after examining a patient.‡ The nose is also exposed to the risk of contamination from unsterilized surgical instruments.

Symptoms.—The local irritation, swelling, obstruction, discharge, disfigurement, and pain attract the patient's attention about the third or fourth week after inoculation. The infection of the vestibule of the nose, or the anterior part of the septum, produces a hard, indurated thickening, in a boggy area, with a deep ulcerated surface and little discharge. Sometimes a fungating mass is all that is discernible. The nostril on the affected side is considerably stenosed. A gland in the submaxillary region may soon reach the size of a large almond; its enlargement and induration are out of proportion to the size or age of the ulceration. The pre-auricular gland also becomes evident. These glands are hard, smooth, and indolent. Neuralgic pains in the head and eye on the same side may be intense, and the temperature may

* Ravant, *Ann. de Derm. et Syph.*, v., No. 5, May, 1914; and *Brit. Med. Journ.*, Epitome, July 18, 1914.

† P. Tissier, *Gaz. des Hôp.*, 1896, No. 20, p. 187. (Gives a bibliography of published cases.)

J. Garel, *Lyon Méd.*, vol. xxxii., 1900, No. 31. (Gives six personal observations.)

J. D. Rolleston, *Lancet*, June 16, 1906, p. 1682. (References to 60 cases.)

H. Loeb, "Inaugural Dissertation," Würzburg, 1906. (Gives references to 225 published cases.)

‡ W. Freudenthal, *Klin. therap. Woch.*, 1901, No. 24.

be raised. In ordinary circumstances the chancre naturally tends to resolution, and heals in six to ten weeks, leaving hardly any cicatrix. If the septum is attacked, it is not perforated. (Fig. 279).

Diagnosis.—The diagnosis of the affection frequently presents



Fig. 279.—Chancre of the vestibule of the nose. (*Castex*.)*

considerable difficulty. In many cases the true nature of the affection is overlooked until the appearance of secondary phenomena. It is most likely to be mistaken for some form of malignant growth. In coming to a conclusion we have to be guided to a great extent by the progress of the case. With simple measures of cleanliness a chancre will improve; a malignant growth continues to increase.

* *Bull. de Laryngol.*, tome 1^{er} trimestre, 30 Mars, 1898, p. 33.

The age and history of the patient afford some suggestion; primary syphilis is most frequently contracted between the twentieth and fortieth years, while malignant disease is uncommon before this latter date. The glandular enlargement is earlier and more marked with a chancre than it would be with a malignant growth of the same size and duration. If the progress of the case does not settle the diagnosis, a portion of the growth may be removed and examined for malignant growth, or specific treatment may be given as a diagnostic test.

Lupus and lupoid tumours may be recognized by their slow history, and by the presence of similar lesions elsewhere. Leprosy and glanders are rare affections. The former is only met with in certain countries, or in those who have lived in them. Glanders only attacks those who are exposed to contact with infected horses (*see* p. 707). A nasal chancre has been mistaken for diphtheria.*

In syphilis in the nose and throat the serum reaction (Wassermann), or the search for the *Spirochæta pallida*, may be required if the diagnosis is obscure. These investigations are particularly indicated in any suspected primary manifestation, as positive results would lead to early treatment.

Prognosis.—The patient must be warned of the serious nature of the complaint, and the length of time required for treatment. The constitutional symptoms are not worse than after infection through the genital organs.

Treatment.—So long as the diagnosis is at all doubtful the treatment should be limited to local cleanliness and the use of antiseptic powders or ointments. Once the character of the ulceration is established, salvarsan should be given, and the suitable general mercurial treatment should be instituted, as described in Chap. XLIX., p. 699. Locally the chancre is energetically washed with sublimate solution (1-500 or 1-1,000), and a 33 per cent. ointment of calomel rubbed into it.

SECONDARY SYPHILIS OF THE NOSE

The secondary manifestations of syphilis are so uncommon in the nose as to be almost unknown. Some observers† state that they never occur, while others take the view that they are generally overlooked, since the pathological changes are of such a nature as to give rise to few symptoms. We meet with it most commonly in the form of "snuffles" in hereditary syphilis (*see* p. 693).

Symptoms.—Nasal symptoms might be expected from seven

* J. D. Rolleston, *loc. cit.*

† Sarremonne, *Arch. Internat. de Laryngol.*, xv., 1902, No. 6, p. 369.

to nine weeks after inoculation, coincidentally with the roseola or other syphilides. Secondary syphilis in the nasal mucous membrane would give rise to a coryza which could only be distinguished from ordinary catarrh by its persistency. The nasal discharge and stenosis are not so marked as in ordinary coryza. The nasal mucosa would be of a bright-red colour, and generally more so on one side than on the other. Mucous patches are very rare, but have been described on the anterior end of the septum and inferior turbinal. Suspicious fissures are more likely to be found on the floor of the vestibules. It would be unusual for the specific character of the affection to be suspected except from the discovery of other symptoms. A positive Wassermann reaction would confirm a suspicion.

Treatment.—Once the diagnosis has been established, a suitable general treatment should be instituted (*see* Chap. XLIX., p. 699). Local treatment is not so important as in either the primary or the tertiary forms, as there is less interference with the functions of the nose. Strong nasal lotions might only aggravate the rhinitis; it is therefore sufficient to prescribe some simple alkaline nose lotion, and a weak mercurial ointment for the vestibules (*see* Formulæ 9 and 76).

TERTIARY SYPHILIS OF THE NOSE

Tertiary syphilis in the nose may be met with in the form of (1) gumma; (2) ulceration; (3) perichondritis and necrosis; and (4) syphilitic ozæna or atrophic rhinitis. The gumma is in all cases the foundation of the several manifestations.

The tertiary is the most common and the most serious form in which the syphilitic poison affects the interior of the nose. It is one of the most important affections we are called on to treat, not only because it causes great inconvenience and distress to the patient, but because it often renders him a pariah while it lasts, and may leave the stigmata of the disease in his physiognomy for life. Besides, by extension to the brain it may entail death. Post-mortem examination shows that lesions of the nose are found in 2·8 per cent. of syphilitic subjects.*

Etiology.—Tertiary symptoms may appear in the nose any time after the second year from the date of infection. They have been met with a few months after infection, and before the secondary symptoms have disappeared.† The time of onset, according to the statistics of Michelson and Tissier, is from one to three years from the date of infection. Still, it is rare to find tertiary syphilis before the fifth year of the disease. On the other hand, there is hardly any

* Willigk, *Prüger Vierteljahrschr.*, Bd. xxiii., 1856, No. 2.

† W. Scott Renner, *Trans. Amer. Laryngol. Assoc.*, 1903, p. 15.

limit to the lateness of the date at which it may appear, an interval of twenty years being not at all exceptional.

Pathology.—The histological characters of a gumma need not be described, as it resembles that found in other regions. It is deposited in the submucous tissue, between the mucosa and the periosteum or perichondrium. The favourite site is the septum, and next in order come the inferior turbinals and the floor of the nose. It may also affect the nasal bones, or the *alæ nasi*. In early stages it causes so few symptoms that it is seldom detected before cell proliferation and ulceration have broken it down, so that it first comes under observation as an ulcerating gumma. Necrosis is also a characteristic, though not inevitable, part of the process. The sclerosis, or fibroid degeneration, which forms so frequent a feature of the changes wrought by syphilis in the larynx, is almost unknown in the nose, although a diffuse gummatous infiltration in the nose has been described by Chiari* and J. N. Mackenzie.†

Symptoms. 1 and 2. **Gumma and ulceration.**—The formation of a gumma in the nose may be unattended by symptoms in the early stages. This is a point which adds to the serious character of the affection, for a patient rarely presents himself until a gumma has broken down, and the damage done is then fairly extensive. Certain vague symptoms, such as headache and neuralgia, possibly worse at night, may induce a patient to seek advice, when the septum should be carefully examined for any soft swelling. Or the eyelids may become puffy, and the face swollen and tender. As a rule, what generally compels his attention is the occurrence of nasal obstruction, pain, and discharge. It is curious that the patient's sense of obstruction is often out of proportion to the degree of impermeability. The stenosis may be of such extent as to cause nasal speech, although this form of rhinolalia must be distinguished from that due to any implication of the action of the soft palate by the disease, or to perforation of the hard or soft palate. The pain may be intense, and is referred to the nose as a whole, to the region of the frontal sinus, or to the head generally. It is nearly always worse at night, when it is sometimes said to be "maddening." These pains generally diminish as the gumma breaks down, and once the discharge is established they usually cease. The discharge is but slight in the early days of obstruction, perhaps only a few drops of muco-pus, which give little relief. Later on it is crusty and offensive, though the smell is not so foul and characteristic as when the bone is involved. The crusts consist of more or less dried pieces of muco-pus, green, yellow, or even blackish, and sometimes forming incomplete casts of the part of the nasal cavity to which they had

* "Krankheiten der Nase," 1902.

† *Journ. of Laryngol.*, April, 1889, p. 139.

adhered. The separation of these scabs may cause a certain amount of hemorrhage, but regular epistaxis is not common. The olfactory sense of the patient is, fortunately for himself, so impaired that he is unconscious of the smell which may emanate from him. When the gumma occurs on the inferior turbinal, the nose externally is sometimes thick and bulbous. If it is in the region of the nasal bones, they appear swollen, and pressure on them is painful and leaves on the skin a pit of œdema. This may be a diagnostic point of some importance.

Syphilis in the vestibule of the nose may completely destroy the columella, or eat its way through to the skin of the face, causing a perforation or entire destruction of the ala nasi. In other cases the infiltration and fungation may imitate a malignant growth.

Examination.—If an examination should be made in the early stage of a gumma, the nasal mucous membrane will be found of a much deeper tint than in ordinary catarrh; this is not generalized but is more marked near any swelling. The use of cocaine may reveal a red, ill-defined tumour in one of the favourite situations, but most commonly on the septum. It will be firm to the probe, and does not retract under cocaine. Probably it would already be soft and fluctuating in its centre, but as a matter of fact it seldom comes under observation before it has softened and ulcerated. In that case the examiner may be struck with the smell from the nose. Inspection of the interior may be concealed by masses of secretion and crusts, so that the cavity must be first cleansed and cocainized before a complete examination is possible. This will reveal the syphilitic gummatous ulceration, whose appearance is fairly characteristic. It is irregular in extent and outline. The margins may be vertical or overhanging, and thickened and indurated, but they are frequently irregular, granulating, and bleed easily. The base of the ulcer is deep and flat, concealed by a coating of thick, tenacious, yellow pus, and at the bottom of it bare bone can often be felt with the nasal probe.

Gummatous infiltration.—A more diffuse infiltration of the gummatous process may occur with obscure symptoms. The patient then complains of bilateral nasal obstruction, generally constant, and often complete, so that the voice is "dead." There is anosmia, but very little discharge. Pain in and around the root of the nose, worse at night, may be severe.

Examination shows the nose to be generally swollen and distended across the bridge, but there is no redness. Two fairly characteristic symptoms may be present: one is the marked tenderness elicited on pressing along the bridge of the nose (i.e. over the nasal bones or edge of the quadrilateral cartilage), and the other

is that the obstruction rarely intermits, and is practically uninfluenced by the use of cocaine. The interior of the nose is darkly congested, and little of it is visible, as the swollen inferior turbinal is tightly packed against the inflamed septum. The discharge is watery or muco-purulent.

Concomitant symptoms may assist the diagnosis. This should be made early, as prompt and active treatment will secure complete restoration of healthy nasal cavities; but if the infiltration is overlooked the nose may fall in and extensive destruction occur.

The *alæ nasi* are sometimes attacked by a gummatous infiltration, one or both vestibules becoming lined with an indolent, brawny, rough, ulcerating infiltration. The deposit, covered with scabs, frequently obstructs the lumen more or less completely, while the skin on the outer side and over the tip of the nose is red, swollen, and tense. The condition is often mistaken for lupus, rodent ulcer, or malignant growth. It may lead to occlusion of the air-way and disfigurement by cicatricial atrophy of the *alæ* and *columella*, but with suitable treatment this can be prevented. Syphiloma is the name given to a rare form of tumour, most frequently found on the cartilaginous septum, sessile or pedunculated, and with no tendency to break down.*

3. **Perichondritis and necrosis** may be primary or occur as a later stage of gummatous ulceration. The extension to the perichondrium and bone is indicated by increased swelling, tenderness on making external pressure, and pain which is worse at night. When the perichondrium gives way, or the bone becomes bare, there is considerable relief to the local pain, obstruction, and discomfort, although the patient is then more troubled with the expulsion of crusts and the increasing foulness of the odour. The objectionable smell is not due to anything specific in the secretion, but simply to the stagnation and putrefaction of dead tissue in the meatuses of the nose. Hence, in those cases where the ulceration has not spread to the periosteum, and the nose has been kept fairly clean, the odour may be wanting, but it is frequently so disgusting and penetrating that the patient is practically banished from society. The smell is somewhat different from that of *ozæna*, and spreads farther. It is in such cases that difficulty may be met with in the diagnosis, especially if the suspicion of malignant disease is raised (cf. p. 216).

Portions of necrosed bone are sometimes blown out of the nose. They may be black, unrecognizable masses, or white and porous,

* Kuhn, *Deut. med. Woch.*, 1896, No. 5, S. 35.

Manasse, *Virchow's Arch.*, cxlvii., 1897, S. 23.

Kuttner, *Arch. f. Laryngol.*, 1898, Bd. vii., Hefte 2, 3.

and their shape may reveal their origin from the septum, turbinals, or floor of the nose.

Examination.—A probe will detect bare cartilage or bone in the depths of any ulcer, and give information as to the size and mobility of a sequestrum. In the septum a perforation may occur far back in the vomer, and be concealed by a deviation. Another favourite site in the bony septum is near the floor, anteriorly. This is often indicated by a small swelling, like a watch-glass, in the middle line of the hard palate, and close behind the gum. Any fluctuation here, with nasal symptoms, is strongly suggestive of tertiary necrosis, and if bare bone can be felt, or a probe passes through from the roof of the mouth to the nose, the diagnosis is certain.

The perforation may involve the cartilaginous as well as the bony septum, and practically the whole partition may be destroyed. When the process is located anteriorly, it may destroy the columella of the nose, and the subsequent retraction leads to an ugly deformity which is very difficult to correct. The probe must be carefully directed to the roof of the nose, on account of the risk of propagation of septic infection to the brain. The necrosed bone may be found loose in the nose, and is often irregular, hard, black, and very fetid. The ulcerated surface below it slowly heals, but the loss of substance is, of course, permanent. While small perforations through the soft palate or bony floor of the nose will often close, the larger ones are permanent, and this is particularly true with regard to destruction of the septum. The ciliated epithelium of the mucous membrane is replaced by the flat epithelium of cicatricial tissue. The inflammatory process is generally widely extended, and in untreated cases it is gradually converted into scar tissue, which slowly contracts and produces the disfigurement so often associated with this affection. The nose does not fall in because the support of the septum is removed; like all bridges, it is not supported at the centre of the arch, but from each buttress; the septum can be almost entirely removed in a surgical operation and yet the bridge of the nose does not collapse (Fig. 99, p. 174), nor, as a matter of fact, does it fall in immediately when the greater portion of the septum has necrosed away. The arch founders gradually—a result that is due, not to the removal of its supports, but to the powerful traction exerted by the shrinking of the scar tissue. If suitable treatment is instituted early these results can generally be avoided, even although there may be a large perforation in the septum.

When the nasal bones are attacked with syphilitic disease the upper part of the bridge caves in, and, although the nostrils remain unaffected and the septal cartilage intact, a characteristic external

disfigurement is produced (Fig. 287, p. 694). This is further accentuated if the septum is destroyed, and the lower part of the bridge also falls in.

Syphilitic necrosis may affect the walls of the nose, invading the superior maxilla, destroying the lachrymal canal, or leading to exfoliation of large pieces of the ethmoid or sphenoid. In this way dacryocystitis is produced, portions of necrosed bone may become loose and fall into the throat, and the cranial cavity may be exposed and fatal meningeal complications ensue.

4. The term *ozæna* is occasionally applied to fetid syphilitic changes in the nose, but it should be abandoned as it only leads to confusion. **Atrophic rhinitis** is often left as a permanent sequela of syphilitic changes in the nasal chambers. If there is much destruction of the surface of the inferior turbinals, there will be continual crusting and scabbing, unless the cavities are kept clean. A small perforation in the septum, particularly if some way from the vestibules, may have its margins completely cicatrized, and give no trouble. If near the orifice, there will be troublesome drying and crusting of secretion should bone or cartilage remain exposed.

The case may not present itself until, the necrosed bone having come away, the ulceration has more or less healed, and the bridge of the nose is slowly falling in. As the spontaneous cure takes place the retraction of the scar tissue slowly pulls down the bridge of the nose, while the uninjured vestibules still remain erect, but pulled backwards by the contraction. The continuation of this process gives us the well known "saddle-back" or "frog face" which is said to be characteristic of the disease, although it must be distinguished from that of *ozæna*. The French name of "*nez en lorgnetto*" is perhaps more descriptive, as it indicates the appearance of the nasal orifices, widely opened and tilted upwards so as to be vertical instead of horizontal, while the main body of the nose—the bridge—is collapsed and wasted (Fig. 287, p. 694).

Diagnosis.—This is based on the three cardinal symptoms of obstruction, swelling, and pain, and on the minor symptoms of fetor and exposed bone. The signs of syphilis, past or present, in the postnasal space, pharynx, mouth, larynx, or elsewhere, will assist the diagnosis. While in many cases there is nothing easier than the diagnosis of nasal syphilis, there are others in which the task presents some difficulty. One of the first guiding principles to bear in mind is that necrosis in the nose is almost unknown except in connexion with syphilis. It is possible that necrosis might arise from trauma, but it is not known in connexion with any other process. Hence the discovery of dead bone, and the recognition that it is not a foreign body or a rhinolith, will at

once settle the diagnosis. The offensive smell might suggest the diagnosis of ozæna. In the latter, however, the mucous membrane is seldom ulcerated and the bones are never necrosed.

From the ulceration of lupus there may be more difficulty in distinguishing some cases; but the special characters of the latter, as well as the general coincidence of a skin lesion, serve to mark the distinction. There is no characteristic odour about lupus.

It is from malignant disease, especially when the bone has not been affected, that we sometimes find difficulty in making the distinction. For particulars the reader is referred to the section on Malignant Growths in the Nose (p. 216). In many cases the administration of antisypilitic remedies must be tried.

The admission, or the denial, of a history of syphilis may only be misleading. A positive Wassermann reaction is strongly confirmatory.

All perforations of the septum are not produced by syphilis. In fact those perforations occurring anteriorly, and limited to the cartilaginous septum, are, with hardly an exception, due to other causes, such as surgical measures (p. 167), traumatism (p. 154), lupus (p. 617), enteric (p. 717), and, possibly, rheumatism. The syphilitic process leading to a perforation in the septum attacks by preference the chondro-ethmoid suture, or the posterior part of the vomer. Consequently it may involve both cartilage and bone; but it nearly always involves bone.

Prognosis.—The prognosis of tertiary syphilis anywhere in the nose and throat will depend on the site and extent of the lesions; the age, habits, and circumstances of the patient; the presence of any organic disease, especially renal; a history of alcoholism; and delayed or inefficient treatment.

Patients are sometimes depressed with fear as to the deformity which may ensue. If they do not realize this possibility they should be gently warned of it, while they can be assured that with care and prolonged treatment it can be almost certainly avoided.

General treatment.—There are few manifestations of syphilis which require more prompt and active treatment, or which yield more satisfactory results, than those occurring in the nose. If a case presents itself in an early stage, before or just after a gumma has broken down, the chance of disfigurement can by treatment be reduced to a minimum, while even in more advanced cases, if marked retraction has not taken place it can generally be avoided. Unless contra-indicated, salvarsan should be injected (p. 699), and, failing this, the general treatment begins with the prompt administration of iodide of potassium, commencing with small doses, but, in inveterate cases, increasing them steadily up to

even 30 or 60 grains three times a day. There are many cases in which this drug alone will have magical effects when combined with suitable local remedies, but there are others in which it appears almost useless without the administration of mercury, and in all cases this latter drug is called for, not only for the relief of symptoms, but because if given through the skin it prevents the legacy of atrophic rhinitis and disfigurement. The selection of remedies, doses, and methods is described in Chap. XLIX., p. 699.

The **local treatment**, although secondary in importance to the general, will help to the speedy relief of the patient and the completeness of the cure. The nose should be rendered as clean as possible by copious warm irrigations with one of the cleansing alkaline lotions (Formula 9). A spray has seldom sufficient force in the early stages to detach and wash away the adherent crusts. The anterior or posterior nasal syringes, or the nasal douche carefully employed (p. 56), will be effective. As there is generally considerable injury to the mucous membrane, we need be less chary in employing some mild antiseptic to correct the fetor. This can be done by the addition of lysol, sanitas, phenosalyl (1-1,000), or any of the compound antiseptics (*see* Formulæ 10 and 11). This cleansing will reveal the actual condition of the walls of the nasal cavities, and the floors of the ulcer can be further purified by the careful insufflation of iodoform, euphphen, formalin, loretin, dermatol, or aristol. Very foul surfaces can be cleansed with peroxide of hydrogen (10 vols.) or perhydrol (3 per cent.), used on mops or added in these strengths to the alkaline nose-lotion. When the ulcers have thus been rendered healthier, recovery can be stimulated by touching their floor and margins with a solution of chromic acid (gr. x to 3i), sulphate of copper (gr. xx to 3i), or nitrate of silver. An application about once a week is sufficient. An oily mercurial spray (Formula 70) will prevent crusts from adhering, and a mercurial ointment will be useful if there is any ulceration in or near the vestibules. If crusts and fetor are very troublesome, removal is facilitated, and re-formation hindered, by packing the nose lightly for twelve or twenty-four hours with 1-inch-wide ribbon gauze, either plain, or prepared with iodoform or double cyanide of mercury. The latter should be wrung out of 1-40 carbolic lotion. The packing can be preceded by inhaling sublimed calomel (Fig. 289, p. 703).

The discovery of a sequestrum always calls for active interference. Its presence inevitably maintains the fetid secretion and retards the healing process. Its expulsion should therefore be hastened, but not in a reckless manner. It has been proposed that, once discovered, dead bone should be removed at all cost.

But if the sequestrum is fixed we must wait until it is loose. Its detachment will be expedited by mercurial inunctions and the local treatment recommended. As soon as any movement is detected in the dead mass we can proceed, under cocaine, to help in detaching it. Various forms of polypus and other strong toothed forceps may be required, and the necrosed bone has to be raised from its bed by a variety of levering and to-and-fro movements. Several sittings may be required; but this is inevitable, as any violent measures are soon arrested by the hæmorrhage, which is often considerable. When the necrosed bone has become loose it may be too large for extraction through the nares; it has been known that a mass like the greater part of the body of the sphenoid has necrosed away. In such a case the dead bone is broken up *in situ*, and then removed piecemeal through either the anterior or posterior nares. It is only rarely that some such operation as that of Rouge is required.

POSTSYPHILITIC AFFECTIONS OF THE NOSE

The sequelæ of nasal syphilis which may be considered are the following:—

1. Stenosis and atresia of the vestibules.
2. Atrophic rhinitis.
3. Perforations of the palate.
4. External deformities.

1. Gummatous ulceration of the skin lining the vestibules of the nose is very prone to contract, so that complete obliteration of the orifice may be produced. This is generally avoided in cases which respond satisfactorily to active treatment. When stenosis threatens, a small length of rubber drainage-tube, of as large a bore as possible, is well smeared with a mercurial ointment (such as ung. hydrargyri oxid. flav. dil.), and worn in the nostril regularly, being changed night and morning. Or Francis's dilators (Fig. 69, p. 119) can be used in the same way.

The central columella of the nose is sometimes destroyed, so that there is only one common nasal vestibule. Or cicatrization and scar retraction may lead to much disfigurement by pulling down the end of the nose, and so reduce the lumina of the vestibules to minute circular orifices. A plastic operation, followed by the use of dilators, may be required to remedy this.

Operations for these deformities are generally very disappointing, owing to the low vitality of the flaps and their tendency to contract.

2. The condition of atrophic rhinitis which may be left by

syphilis in the nose is described on p. 664. It requires the care and treatment recommended in the atrophy of ozæna (p. 140).

3. Perforations in the hard palate, if not larger than a cedar pencil, may close up if treatment is instituted as soon as they appear and the margins are stimulated with nitrate of silver or chromic acid.

If the necrosed bone is of the size of a sixpence or larger (Fig. 283, p. 683), there is little hope of the perforation ever closing. Plastic operations on it are not, as a rule, very successful, and the patient is generally well advised to be content with having the defect in his voice remedied by wearing a vulcanite or gold obturator, made by a dentist (Fig. 284).

4. The anticipation of external deformities of the nose by active treatment has been referred to (p. 665). It may be mentioned that the use of internal splints to prevent these consequences is quite unserviceable.

Before undertaking any measures for the correction of external deformities, it is important to make sure that the syphilitic process has quite ceased. If there is any doubt as to this, or if the Wassermann reaction is still positive, it would be best to give an extra course of mercury, by inunction or injection. Salvarsan is seldom of much use in these post-syphilitic conditions.

The numerous operations designed to remedy nasal deformities due to syphilis have proved very disappointing. For descriptions of plastic operations the reader is referred to works on general surgery.

Paraffin injections.—This method of improving the shape of "saddle-back" or "bull-dog" noses is the most reliable. In addition to determining that there is no active syphilitic process going on, it is necessary to be sure that the skin is loose over the sunken area. If it is bound down to the collapsed bridge it will be necessary to undermine it first, so as to form a bed for the paraffin.

Choice of paraffin.—In order to avoid the risks of the operation to be mentioned later, Mahu has recommended the injection of cold paraffin by means of a special syringe.

Walker Downie, who has had experience of 200 cases, extended over seven years, holds that the improvement is permanent when the paraffin has been properly injected. He thinks that when injected in the solid state it never becomes intimately incorporated with the subcutaneous tissues, as it does when injected in the fine particles of the molten state.* But Harmon Smith, also with a long experience extending over some years, claims for the injection of paraffin in the solid state that it is less liable to assume a small globular shape, and will therefore reduce the danger of embolus;

* *Brit. Med. Journ.*, Oct. 10, 1908, p. 1102.

it is also more likely to form for itself a berth of connective tissue, which will ensure against subsequent displacements. He uses a hard paraffin mixed with albolene until the melting point is reduced to 115° F. (46.1° C.).

Fate of injected paraffin.—There are various views as to the fate of the embedded paraffin. It is held that it may be slowly absorbed, or scattered, or replaced by fibrous tissue; but in successful cases it has been found in position two years afterwards.

Operation.—The method employed by Harmon Smith has proved simple and satisfactory.* A tube of sterilized paraffin is placed in a water bath of a temperature 5° or 6° higher than its melting point of 115° F. A suitable syringe is sterilized, filled with the melted paraffin, and then lies in cold sterilized water until the surgeon is ready. The skin of the nose is thoroughly purified. No anæsthetic is required. An assistant stands behind the patient to make firm pressure with his forefingers round the root and sides of the nose, so as to prevent any leakage up towards the eyelids. The surgeon now immerses the syringe in hot water, and gives the piston several turns until the paraffin winds out in a hard, thin, cylindrical thread. He then introduces the needle subcutaneously, starting just above the depression, and injects steadily and slowly as the needle is withdrawn. About 2 cm. is sufficient. It is much better to inject too little and repeat on another occasion, than to introduce the least quantity too much. Laying down the syringe, the surgeon rapidly moulds the subcutaneous mass into the desired shape. A collodion dressing is placed over the site of puncture. Any reaction is met with iced applications. No further injection should be made for at least a month.

Dangers.—Cases of permanent blindness have been recorded, due to a paraffin embolus. The embedded mass has sometimes shifted to one side, or travelled into the loose tissue of the eyelids, whence it had to be removed by operation. These risks can, according to observers with large experience, be altogether avoided by due care.

Results.—Caution is required in advising this operation. In very slight depressions it should be avoided, as a worse deformity may be produced. In well marked and selected cases excellent and permanent results may be expected in experienced hands.† (Figs. 287 and 288, pp. 694, 695.)

* *Laryngoscope*, xviii., 1908, No. 10, p. 798.

† Tubes of prepared and sterilized paraffin of the required melting-point, as well as suitable syringes, are supplied by Mr. F. A. Rogers, 327, Oxford Street, London, W., and Mr. C. N. Leigh, chemist, 158, Madison Avenue, New York City, N.Y.

The "Paraffinostyle," designed by Robert Leroux and made by La Maison Bruneau, Paris, permits of cold paraffin being injected direct from its glass ampoule, without its running any chance of contamination from exposure. (*Ann. des Mal. de l'Oreille*, xxxviii., 1912, No. 12, p. 634.)

CHAPTER XLVI

SYPHILIS OF THE UPPER AIR-PASSAGES

(Continued)

SYPHILIS OF THE PHARYNX, TONSILS, AND NASO-PHARYNX

In this region syphilis may occur (*a*) as an acquired, or (*b*) as an hereditary disease. The former is met with in all three stages; the latter occurs in the secondary and tertiary forms. The recognition and prompt treatment of the disease in the throat is of the greatest importance, for here, as in the nose, it is apt to produce some of its most distressing and permanent features, and a careful study of its pharyngeal manifestations is important since the secondary appearances form an integral part of the general specific manifestation.

PRIMARY SYPHILIS

Etiology.—It is said that the pharynx is rarely the site of a primary chancre, though recent literature tends to prove that this rarity is probably only due to the disease having escaped observation. Thus, W. Cheatham* claims to have seen seven cases within eighteen months, and the records of 290 published cases have been collected by Joseph Kaesbohrer.†

In a series of 272 cases of syphilitic chancre of the tonsils and pharynx, collected by him in the literature of the subject, K. Szadek found 200 cases of primary induration of the tonsils. The chancre was located on the right tonsil in 112 cases, and on the left in 53; both tonsils were affected in 15 cases; in 20 cases the particular tonsil is not mentioned. In 29 cases the primary induration was situated on the pharynx, and in 20 on the palate. The ages varied from 3 to 85 years.‡ The oro-pharynx is, perhaps, the most usual site of infection in "syphilis insontium." An analysis of 9,058 recorded cases of extra-genital chancres shows that 307 occurred on the tonsil.§

Primary lesions of the tonsils are somewhat more frequent in women than in men. It should be remembered that infection is as likely

* *Laryngoscope*, xiii., 1903, No. 2, p. 162.

† Buchdruckerei Robert Noske; Borna—Leipzig, 1906.

‡ Sajous' *Annual of the Universal Med. Sci.*, 1895, vol. iv.

§ L. Duncan Bulkley, "Syphilis in the Innocent." New York.

to arise from a secondary mucous plaque as from a primary sore. Hence not only may the disease be contracted by unnatural practices, but contamination may also arise from kissing, the use of public drinking cups, and of infected domestic utensils—spoons and forks, as well as from pipes, tooth-brushes, glass blow-pipes, musical instruments, or from unpurified surgical or dental instruments. Tonsillotomy has been known to be followed by a primary chancre,* and tonsillotomes should always be taken to pieces and sterilized after use, as it is otherwise difficult to ensure complete disinfection of their interstices. In the naso-pharynx, syphilis has been inoculated by a Eustachian catheter. It may also be carried to the mouth on a finger-nail. Nurses who have the habit of sucking feeding-bottles, to start the flow of milk, have been known to contract the disease from syphilitic infants. The tonsil is the most common site of the initial lesion, but it may be seen on the lips, tongue, pillars of the fauces, and more rarely on the posterior pharyngeal wall. It has even been found on the lingual tonsil and on the epiglottis.

Symptoms.—The patient may only complain of a slight sore throat, which appears to him so trivial that possibly this explains why some cases escape notice, and so go to swell the instances in which patients are genuinely ignorant of any initial lesion. As a rule there is burning or discomfort in the throat, with difficulty in swallowing. In some cases this may even be severe, and accompanied with earache, and in addition there may be headache, malaise, rigors, and a temperature of 104° F.

Examination.—It might be thought that the characters of a chancre in the pharynx would be as well defined as when it occurs in other parts. This is not so. They are apt to be obscured by a general inflammation of the tonsil, the entire gland being inflamed, enlarged, and indurated, while the sore itself may be so concealed by mucus as to escape observation. The indurated base to which we are accustomed elsewhere is not a prominent symptom. The sore varies very much in appearance, and may present as an erosion, an ulcer, a sprouting or cauliflower-like growth, a diphtheroid or membranous ulcer, or a sloughing or gangrenous ulcer. In all cases the tonsil becomes very firm and dense, while the glands at the angle of the jaw are always enlarged, painful, mobile, and hard, but they do not suppurate, and the skin over them is unaltered.

Diagnosis.—According to Fournier the diagnosis is not difficult; it is sufficient to keep syphilis, as a possibility, in mind in order not to overlook it. The following points should always arouse a suspicion of syphilis, viz. (a) a one-sided affection of the tonsil, (b) with an indurated base and (c) early enlarged submaxillary

* W. H. Kelson, *Brit. Med. Journ.*, Oct. 26, 1901.
P. H. Abercrombie, *ibid.*

glands, in (d) a young subject. The suspicion is further strengthened if the glands are indolent, movable, and show no tendency to suppurate; if the symptoms are not acute; and if they have lasted some weeks before the patient presents himself. Still, in most cases, the diagnosis is a delicate matter, and it is impossible to have more than a suspicion of the true nature of the disease, and complete confirmation is often delayed until the development of secondary symptoms. But in a suspected case the *Spirochæta pallida* should be sought for, as its early detection might lead to the prevention of a general infection; and a positive Wassermann reaction would warrant early specific treatment.

The diagnosis may also have to be made from a considerable number of diseases, owing to the polymorphic nature of the tonsillar chancre. Thus a chancre might be mistaken for malignant disease, lacunar tonsillitis, diphtheria, tubercle, or Vincent's angina. It must also be distinguished from a syphilitic ulcer, and from a breaking-down tertiary gumma. From malignant disease it can be diagnosed by its usually occurring in a younger subject; more rapid increase; earlier and more marked enlargement of the lymphatic glands in proportion to the size of the sore; absence of hæmorrhage; absence of infiltration in the neighbourhood; and the supervention of secondary symptoms. In cases of doubt a portion of the affected tonsil could be removed and submitted to microscopical examination, especially if the condition is not amenable to mercurial treatment.

Lacunar tonsillitis is almost inevitably bilateral, and the glands on both sides are enlarged. There is always some fever, and more local discomfort and general malaise. The development of exudate in the various crypts can be watched. The disease runs a more or less regular course, and ends in a week to ten days.

The symptoms of diphtheria are so characteristic, in the majority of cases, that it is only when the local manifestation is limited to one spot on one tonsil that any difficulty of diagnosis could arise. Even then the general symptoms, the results of bacteriological examination, and the progressive character of the affection will settle the point.

Tuberculosis is rarely met with in any part of the pharynx. When it does occur it generally originates, and is most marked, in the region of the uvula and soft palate. As it is almost inevitably secondary to the deposit of tubercle in the lungs, the general condition of the patient and the history of the case will easily distinguish the lesion from a primary chancre. The submaxillary glands are generally enlarged.

Ulcerating membranous tonsillitis, or Vincent's angina, is a comparatively rare affection, but is above all others the one most likely to be mistaken for syphilis.* The differential diagnosis is considered at p. 415.

* M. Perrin and A. Grosjean, *Rev. Hebdomadaire de Laryngol.*, xxiv., 25 Juillet, 1903, No. 30, p. 97.

A tonsillar chancre is distinguished from a tertiary ulcer by being more on the surface, by the stony hardness of the whole tonsil, and by the enlarged cervical glands. The eruption of secondary rashes will settle the difference. The appearances of a breaking-down gumma are described at p. 678.

Prognosis.—The disease lasts from one to two months. It is commonly thought that the general infection is more virulent when inoculation takes place through the mouth or pharynx. There does not seem to be any justification for this view.

Treatment.—It is seldom that the diagnosis of a primary chancre of the pharynx is positively established before the appearance of secondary symptoms; but specific general treatment should be initiated as early as possible (*see* Chap. XLIX., p. 699). Locally, treatment consists essentially of cleansing measures. The tonsil should be frequently syringed or sprayed with warm alkaline lotions, and dusted with eucrophen or similar powder. The patients who cannot conveniently do this should gargle with tepid salt-and-water.

The patient should be informed that, for the sake of others, he must scrupulously avoid all the direct or indirect methods of infection already referred to (*cf.* p. 670).

The chancre itself is treated as follows: After the surface has been thoroughly cleansed it is dried with cotton-wool mops, and the base of the sore is touched with the end of a glass rod moistened with pure carbolic acid. A minute is then allowed to elapse for the carbolic acid to exert its local effect. The application is painless. Care should be taken that the surface is thoroughly dried, as this limits the action of the acid. Only a small quantity should be taken on the glass rod, from which it should not hang in a drop. At the end of a minute any superfluous acid can be wiped off with cotton-wool or a piece of blotting-paper. This application can be repeated, if required, when the eschar separates. The surface of the sore and tonsil, if coated with a tenacious slough or mucus, can also be cleansed by the addition of peroxide of hydrogen to the alkaline lotion. The patient should keep the teeth and mouth very clean, making frequent use of a gargle of chlorate of potash, *lotio nigra*, carbolic acid, corrosive sublimate (1-5,000), *listerine*, *phenosaly* (1-3 per 1,000), etc.

A milder, though less effective measure, is to paint the sore with nitrate of silver (20 per cent.) or chloride of zinc (3 per cent.), or even with *glycerinum acidi carbolici*.

Recent observations on the marked power of mercurial ointment in aborting general infection from a primary sore, if employed early enough, would suggest the rubbing-in of an ointment of 1 part of mercury with 3 parts of lanolin; or the

tonsillar sore might be powdered with calomel; or the entire gland enucleated.

SECONDARY SYPHILIS OF THE PHARYNX

The secondary appearances of syphilis in the pharynx deserve consideration, for not only do they follow primary local infection, but they occur after inoculation in any other part of the body. This secondary stage is analogous to the eruptive period of a specific fever; syphilis during this period is a general disease with constitutional symptoms; and the infection can be transmitted by the secretion from any of the lesions, and by the saliva and other normal fluids.*

Invasion.—In acquired syphilis the pharyngeal symptoms appear in common with other secondary symptoms between five and twelve weeks after the primary inoculation. But they tend to reappear at much later dates. They are, perhaps, most frequent in the first and second years after infection.

Symptoms.—These are often very slight, so that, unfortunately, in patients who are insensitive or careless of their health, they may pass undetected. As a rule there are the usual feelings associated with pain and dryness of the pharynx. There may be some discomfort in swallowing, and, according to some observers, dysphagia is constant and persistent.†

Examination.—The secondary manifestations of syphilis chiefly assume the forms of (a) syphilitic erythema, and (b) the mucous patch. We may also add (c) a general hypertrophy of the lymphoid tissue of all the tonsils—palatine, lingual, and pharyngeal.

(a) *Syphilitic erythema* is the earliest and most constant manifestation. It commences about the same time as rashes on the skin—five to twelve weeks after the initial sore. It may occur in isolated or symmetrical patches, and it may be found on any part or on the entire surface of the tonsils, pharynx, and soft palate. It is of a peculiar dusky-red colour, and the erythematous patch does not shade off gradually into the surrounding surface, but ends abruptly with a well-defined margin. This is well marked at the junction of the soft and hard palate. When of limited extent the erythema is best seen on the anterior pillars and neighbouring soft palate. It tends to be more or less symmetrical on both sides. It may escape detection when the throat is examined by artificial light, and in all doubtful cases it is important to inspect the pharynx by direct or reflected daylight. There is always some catarrh with this syphilide, and it may extend to the Eustachian

* Malcolm Morris, "Diseases of the Skin," p. 472. Fifth edition, London, 1911.

† Escat, "Traité des Maladies du Pharynx," p. 349. Paris, 1901.

tube, causing some deafness and tinnitus. The tonsils, including those of the naso-pharynx and base of the tongue, are enlarged, even sufficiently to produce the tonsillar voice.

(b) The *mucous patch*, or plaque, or papule, generally follows the appearance of the rash on the skin; but it may precede it, or occur later in the disease, and at the same time as tertiary manifestations, and it may recur. I have seen it present in the throat with gummatous ulcerations eight years after a tertiary lesion, and fifteen years after primary inoculation. A plaque may appear while the primary sore is still present, but an average date is about

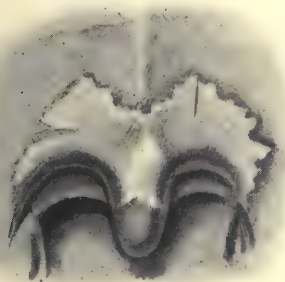


Fig. 280.—Secondary syphilis of the pharynx.

Mucous patch which appeared after an ulceration on the left tonsil. The latter was at first taken for diphtheria, and the patient was sent to a fever hospital. When no Klebs-Löffler bacilli appeared she was discharged. The tonsillar ulcer was then thought to be Vincent's angina, but the appearance of the above mucous patch, together with a coppery rash, settled the diagnosis. The mucous patch must have appeared about six months after infection.



Fig. 281.—Tertiary ulcer of uvula and soft palate.

The scar on the right side of the picture shows where a peritonsillar abscess had been opened a few days previously.

the fourth month. The mucous patch has a characteristic appearance which is difficult to describe, but which, to the trained eye, is pathognomonic of syphilis (Fig. 280). It occurs chiefly on the uvula, soft palate, pillars of the fauces, and the tonsils; but it is also found on the lips, gums, inside of the cheeks, and the margin of the tongue where it rests against the teeth. It is peculiar in never, or rarely, appearing on the posterior pharyngeal wall. (Plate XIII., Fig. 3, facing p. 358.) With the mirror it may also be seen on the posterior surface of the soft palate, the mouth of the Eustachian tube, and the pharyngeal tonsil, as well as the lingual tonsil. The plaque begins as a dusky-red, slightly raised, well-defined surface which soon undergoes superficial

necrosis and forms the mucous patch. This occurs more or less symmetrically disposed on both sides of the middle line. It is hardly raised above the general surface, from which it is separated by a narrow, inflamed areola, as if ringed round by a line of red pencil. Its superficies is flat and presents a delicate milky, opaline, and somewhat translucent appearance which has been compared to a snail-track. It may also become bluish-white or dirty grey in appearance, resembling the appearance of a mucous surface painted with nitrate of silver. It might also suggest the false membrane of diphtheria, but is much more adherent, and without the same tendency to spread. In neglected cases the patch may become swollen and sprouting, so as to resemble the condyloma of other regions. In all doubtful cases it is important to inspect the pharynx with daylight, as artificial illumination does not always reveal the delicate and yet characteristic appearances.

Mucous patches are slighter in females, and worse in smokers.

Confirmation of the nature of the case should be sought by the detection of symptoms in other parts, and daylight is also important for the recognition of specific roseola and other syphilides.

(c) The palatine tonsils have generally disappeared at the age when syphilis is contracted. If not, they not only hypertrophy from the specific poison, but, even with treatment, they tend to increase slowly and sometimes require surgical measures. The enlargement of the lingual tonsil may explain the dysphagia which is sometimes present. The pharyngeal tonsil, if still persistent, also enlarges and gives rise to many of the symptoms of adenoids. It is chiefly attacked in the secondary form of hereditary syphilis.

These characteristic appearances of secondary syphilis are sometimes present at the same time with the serpiginous ulcerations to be described, so that a mucous patch and an ulcer may be found side by side.

Diagnosis.—The appearance of the erythema and of the mucous patch is characteristic, but the untrained eye must to a great extent rely on the simultaneous appearance of other secondary symptoms, of which the most important are the presence of enlarged suboccipital and epitrochlear glands, pains in the bones, headache, loss of hair, and possibly some elevation of temperature. As a rule there is no marked pain, and the absence of general reaction, the long continuance and the slow evolution, will distinguish the disease from follicular tonsillitis. It is curious that it should be so often mistaken for this latter affection, since its most typical manifestations are not on the tonsils themselves.

In aphthæ the patch is of a canary-yellow colour, and is not

symmetrical. Any suspicion of diphtheria can be eliminated by a bacteriological examination, and any of syphilis might be confirmed by a Wassermann reaction.

If the erythema occurs in adults in whom the tonsils were formerly small; if these latter enlarge rapidly; remain swollen longer than in a simple case of tonsillitis; and are accompanied by tender, hard glands, it would suggest the possibility of syphilis, although, in the absence of any history of infection, we may have to await the appearance of other manifestations before deciding.

Prognosis.—Secondary symptoms yield very quickly to treatment. Otherwise they may last from two to six weeks, or even continue for two months. It is well to remember that they may reappear at any time within two years from the date of infection, and also that they may be present along with manifestations of the tertiary period, so that a breaking-down gumma and a mucous patch may come under notice together.

Treatment.—The infection of the secondary period is very virulent, so that the patient should be warned of the risk of conveying contagion in any of the ways mentioned (p. 670). The medical man must also guard himself carefully from any infection being coughed on to his face or adhering to his hands; and instruments should be carefully sterilized immediately after use.

The general treatment is by far the most important (*see* Chap. XLIX., p. 699). But local treatment must not be neglected, as it will not only relieve anxiety and discomfort, but will diminish the risk of contagion. Tobacco should be given up entirely, and alcohol must be taken sparingly, if at all. Spirits and liqueurs must be avoided. After every meal the teeth and gums should be brushed, and an alkaline and antiseptic mouth-wash employed; one of the best is made of equal parts of chlorate of potash gargle and lotio nigra (Formulæ 35 and 36). The patch itself is dried and painted with chromic acid (gr. x-xx to ʒi), tincture of iodine, or nitrate of silver (gr. x-xx to ʒi). If brushed with chromic acid (5-10 per cent.) and immediately afterwards painted with a 30 per cent. solution of nitrate of silver, a chromate of silver is formed *in situ*. In severe forms powdered calomel may be blown in, the sublimed, calomel may be inhaled (p. 703), or the methods described for treating tertiary ulcers (p. 682) may be employed.

TERTIARY SYPHILIS OF THE PHARYNX

The pharynx is often the site of the most marked ravages of neglected tertiary syphilis. Yet its appearances are generally

characteristic, and with prompt diagnosis and suitable treatment its progress can be arrested.

Invasion.—Tertiary symptoms may appear within a few months of the primary lesion, but seldom do so before the third or fourth year. They may reappear at any period, or may delay their first oncoming for many years. I have known them to make their first appearance in the pharynx fifty years after the disease was contracted, but they generally occur between the eighth and fourteenth year after infection.

Forms.—The tertiary manifestations may be classed under the headings of—

1. The serpiginous ulcer.
2. The gumma.
3. Diffuse gummatous infiltration.

1. The *serpiginous ulcer* is an early manifestation, and may be associated with the mucous patch of the secondary period. It may attack any part. The mucous membrane around is congested, dark-red or purplish. The ulcer itself is superficial, with no apparent infiltration. It is covered with a greyish-yellow slough, and the margin is irregularly circular, with well-defined and sometimes swollen edges. The whole appearance is somewhat worm-eaten (Fig. 281).

2. The *gumma*.—This may occur singly, or several may be met with at the same time. Its favourite situations are the soft palate, the roof of the naso-pharynx, the posterior and lateral walls of the pharynx, and the base of the tongue (Plate 1., Fig. 2). It is less often encountered on the tonsils, where gummatous infiltrations are more commonly met with. On the roof of the hard palate a small gummatous node in the middle line, and at the junction of the premaxillary bone with the two superior maxillæ, is not uncommon, and is often associated with tertiary disease of the nose. Being somewhat hidden by the front teeth, it is apt to escape notice (cf. p. 683).

The usual stages of a gumma are (*a*) infiltration, (*b*) softening, (*c*) ulceration, and (*d*) cicatrization; but under favourable conditions the last three stages may be replaced by resolution and absorption.

The stage of infiltration is apt to be so slow and insidious that, in many cases, it passes unperceived. Otherwise a bright-red, congested, elastic swelling would be detected, in which, once softening has commenced, destruction takes place rapidly. Thus, when a gumma commences to break down in the soft palate, we generally find that the deposit has taken place near the centre, but that the whole fleshy curtain is acutely swollen, bright red, and bulging forwards towards the mouth. The patient's voice is markedly

nasal, fluids tend to regurgitate through the nose, and repeated and painful attempts fail to clear the sticky mucus which hangs about. If a postrhinoscopic examination be made it will be seen that the development of the gumma is most marked on the posterior surface, and it is on this side that it generally ulcerates. As this progresses the acuteness of the symptoms may abate, but the patient continues to be troubled with the thick, tenacious muco-pus which he hawks down from his nasopharynx. This stage is often regarded as a "postnasal catarrh," even though associated with pain radiating to the ears. Sometimes the gumma will ulcerate through on to the front, as well as on to the posterior surface, of the soft palate. The anterior opening may be a mere slit, or a stellate fissure, but a probe will generally pass through it easily; and this test is important when it is impossible to inspect the back of the palate, for, when occurring in an acute inflammation of the central portion of the soft palate, it is conclusive evidence of a tertiary gumma. If not arrested at this stage, the ulceration spreads until a large perforation takes place through the palate, of which the greater portion may be destroyed before cicatrization takes place (Fig. 282). This last process leads to the scarring and contraction of any remaining tissue (Plate XIII.; Fig. 4, facing p. 358).

A similar process may be observed on the vault of the nasopharynx, from which it is apt to invade the sphenoid bone.

A very favourite site for a gumma is on the posterior pharyngeal wall, in the middle line, and just above the lower level of the soft palate. Hence it is best seen by posterior rhinoscopy, which should always be employed when stringy muco-pus is seen descending on the posterior wall. In some cases a view of part of such a gumma can be obtained by simply raising the lower edge of the soft palate with the end of a tongue-depressor. A smooth, soft, red swelling is then discovered, with hard edges and a fluctuating



Fig. 282.—Tertiary syphilis of the pharynx.

Shows a large perforation in the soft palate, with scarring and retraction. There is gummatous infiltration of the tongue. The patient, aged 62, died from the results of tertiary syphilitic disease of the thyroid gland and the trachea.

centre. Resolution may take place under prompt treatment, otherwise ulceration soon occurs. This ulcerating gumma on the posterior wall is apt to coincide with the one already described on the posterior surface of the soft palate, and it is owing, in unchecked cases, to the adhesion of these two surfaces that the most marked cases of pharyngeal stenosis are due.

The gumma may be deposited in the periosteum covering the bodies of the cervical vertebræ, leading to caries and necrosis of the cervical vertebræ, and even laying bare the spinal cord.

With a breaking-down gumma in the pharynx any dysphagia is apt to be more marked at night, and is made worse by the presence of tenacious, frothy, clinging muco-pus, which can neither be swallowed nor expectorated.

The voice may be altered, not only when the soft palate is primarily invaded, but also when the disease is situated near its attachments on either side. The palate is then limited in its excursions. The voice at first is "dead," and if the palate is much destroyed it comes to resemble cleft-palate articulation.

3. Diffuse gummatous infiltration.—This may occur anywhere. It is essentially of the same nature as the process already described, with which it may be combined. It may be found as a long ridge between the posterior pharyngeal wall and the posterior palatine fold. It is less characteristic than in other parts of the respiratory tract. The diffuse gummatous infiltration of the tonsils has been mistaken for malignant disease.

Diagnosis.—An early diagnosis is of the greatest importance, as any delay in treatment may conduce to permanent defects. The history, if negative, can be disregarded. In females much assistance may be obtained in suspicious cases by a history of miscarriages. Apart from the appearances which have been described, the chief characteristics associated with a tertiary ulcer are its thickened base, the slow progress, and the absence of pain, fever, or enlarged glands. Deglutition may not be interfered with, though there is often greatly increased secretion. Loss of flesh and cachexia are frequent. Generally speaking, any ulcer in the pharynx should arouse a suspicion of syphilis, and this is strengthened if the floor of the ulcer is covered with a dirty-grey, rather adherent slough, and the margin somewhat thickened. The two other forms of ulcer for which it might be mistaken are those of lupus and of an ulcerating malignant growth. They are, however, relatively rare; while tertiary syphilis in this region is comparatively common.

An epithelioma is distinguished by the usually more advanced

age, early enlargement of glands, the resistance to specific treatment, and the result of microscopical examination.

Compared with lupus, a syphilitic ulcer is marked by its purplish, red, infiltrated neighbourhood, dirty-yellow floor, and well-defined, circular, vertical border. Lupus is generally found on an anæmic mucous membrane. The surface of the lupous ulcer is dotted with lupus granules, and covered with a gummy or dried yellow secretion and no distinct slough. The disease is generally present in the nose and elsewhere. Tuberculosis rarely occurs in the pharynx; is extremely painful; is almost inevitably associated with evidence of the same disease in the lungs; and the submaxillary glands are generally involved.

When occurring at the base of the tongue a gumma may simulate some of the symptoms of tonsillitis, but careful inspection will eliminate any confusion. From acute tonsillitis or peritonsillar abscess it is readily distinguished by its chronic character, and by the absence of acute dysphagia, enlarged glands, or tenderness to touch.

Actinomycosis is an uncommon affection, rarely observed in the pharynx, but it may give rise to some difficulty in diagnosis when it spreads from the lower jaw towards the tonsil. The congested infiltration and the ulcerated surface are very similar to a breaking-down gumma. The difficulty of diagnosis is further complicated by the fact that actinomycosis is rapidly amenable to treatment by the iodides. It is, however, settled by the recognition of yellow grains of actinomyces in the discharge, giving a somewhat gritty sensation to the finger, and, under the microscope, showing the ray-fungus.

Glanders may simulate a malignant attack of tertiary syphilis. It is a rare affection, occurring only in those who have been exposed to contamination with horses; and the general symptoms—joint-affections, existence of enlarged submaxillary glands, special fetor of the breath, abundant discharge, and the detection of the *Bacillus mallei*—will suffice to distinguish it.

Phosphorus poisoning only occurs in workers exposed to this possibility.

Scleroma is seldom seen in this country. Its features are sufficiently distinctive (p. 711).

As in doubtful syphilitic affections in the nose, confirmatory evidence must be sought in the evidence of the disease elsewhere; in postsyphilitic scars in the nose and throat; in the Wassermann reaction; and in the result of a course of specific treatment.

Prognosis.—The general data which help in forming a prognosis are given on p. 665. As the onset of the affection is often slow and

insidious, it is not always possible to do the best for patients. It is also very curious that, even in some advanced conditions, some patients will complain so little that they regard their condition as hardly worthy of notice, though extensive ulceration and destruction may already have taken place. With extensive gummatous ulceration, even under active treatment, scarring and retraction may be unavoidable.

Treatment.—General treatment is of primary importance; it is described in Chap. XLIX., p. 699. Local treatment is of secondary importance; sometimes only cleansing measures are required. Warm alkaline lotions (Formulæ 9 and 10), to which some mild deodorant is added, should be used in a syringe (p. 146) so as to free the throat of the clinging mucus. Peroxide of hydrogen (10 volumes) or perhydrol (3 per cent.) is very suitable for cleansing foul ulcers, which can then be painted with chromic acid (gr. x-xx to 3i) or nitrate of silver (gr. xx to 3i), or touched with sulphate of copper. If the base of the ulcer is very foul or sloughy it may be touched with acid nitrate of mercury or pure carbolic acid. Iodoform or some similar powder may be indicated. The centre of a gumma may require scraping with a sharp spoon. Pain can be relieved by orthoform or a morphia lozenge. The gargle of chlorate of potash and lotio nigra is useful (Formula 35).

POSTSYPHILITIC PHARYNGEAL AFFECTIONS

The sequelæ of tertiary syphilis in the pharynx have characteristic features which it is important to recognize. Mucous patches generally leave no trace behind. When a gumma is arrested before it breaks down, it leaves a somewhat striated puckering which readily escapes notice on soft parts. When occurring in the periosteum of the hard palate it may leave a thickened node, the favourite site for which is in the middle line at the junction of the two superior maxillæ and premaxillary bones. Serpiginous ulceration leaves behind a superficial scarring, which, on the soft palate, inside of the cheeks, and other plane surfaces, has a stellate or star-fish arrangement (Fig. 282). At the corners of the lips it leaves lines. On free edges, as of the uvula and soft palate, there is some contraction, but this is much more marked after the breaking-down of gummata. This latter may lead to the almost entire destruction of the soft palate; and when the process is arrested, recovery is marked by the great tendency for ulcerating surfaces which come in contact to adhere to one another, and for the resulting scar tissue to undergo marked contraction. Thus the soft palate may be drawn up and deformed in various directions (Plate XIII., Fig. 4, facing p. 358). By adhesions it may become united

to the posterior pharyngeal wall, or bound down to the lateral walls. Adhesions between the base of the tongue and the posterior pharyngeal wall may almost completely cut off the communication with both larynx and œsophagus.

On the posterior wall of the pharynx, postsyphilitic scars are apt to radiate from the middle line, and are white and fibrous. It is important to examine them carefully; to make sure if the process is entirely arrested, or if, amid old scar tissue, further infiltration and ulceration is taking place (Fig. 283).



Fig. 283.—Tertiary syphilis of the hard palate and pharynx.

Perforation of the hard palate (showing the septum and inferior turbinals from below); extensive sloughing of the soft palate; ulceration of the fauces and posterior pharyngeal wall; scarring and stenosis of the oro-pharynx.

Perforations are often left permanently in the soft palate. The operation for the repair of cleft palate sometimes leaves a small hole in the central line of the soft palate. This will not be confounded with syphilitic perforations if a careful inspection be made, and the absence of other stigmata noted. Various bands may be left by syphilitic adhesions, attached at each extremity and free in the centre. The anterior pillars of the fauces are sometimes left with permanent perforations. They are distinguished from congenital defects of the fauces (p. 360) by absence of, or less marked, symmetry, and decided scarring of the margin. It is

sometimes more difficult to distinguish these distortions of the pharynx from those left by the acute sloughing of some cases of scarlatina or measles. The latter generally are known to have existed from an earlier age, and the cicatrices do not tend to contract so markedly as do those of syphilis.

Treatment.—If the stenosis between the nose and pharynx, or between the pharynx and gullet or windpipe, is not sufficient to cause much discomfort, it is much wiser to leave matters alone. If mouth-breathing and its sequelæ (p. 92), ear troubles, or other consequences, become marked, the daily passage of bougies may be tried. Of the various plastic operations, the two following are the most satisfactory :—

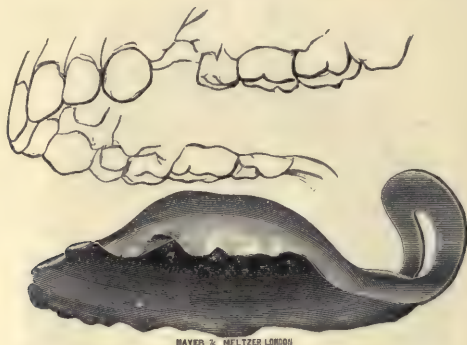


Fig. 284.—Artificial palate (Hamilton's).

Fitted with apparatus to prevent adhesions forming between the soft palate and the posterior wall of the pharynx.

1. Dundas Grant suggests that wires should be inserted through the lateral bands, as ears are pierced for ear-rings, and, when the apertures become permanent, horizontal cuts should be made from them to the free edges.* The idea is founded on the old operation for webbed fingers. This method is also employed by J. E. H. Nichols, who passes a rectangular, curved, cleft-palate needle through the adhesion from behind forwards. This is threaded with silk and withdrawn. A thicker silk is attached to the first and drawn through and knotted in a loop, and left in for one or three weeks. The little canal in which it runs will then have become cicatrized, and the loop of silk may be cut through and removed. A right-angled knife is carefully passed through the cicatricial canal and the tissue cut through to the middle line. In a few days the cut edges heal, and the narrow band of cicatricial tissue at the apex of the cut prevents the tendency for them to unite again.†

2. Under chloroform, and with the hanging head, W. G. Spencer ‡ separates the soft palate from its adhesion to the posterior pharyngeal

* *Proc. Laryngol. Soc., London*, i., 1893, p. 47.

† *Amer. Laryngol. Assoc.*, 18th Congress, 1896, and *N.Y. Med. Journ.*, Sept. 26, 1896.

‡ *Proc. Laryngol. Soc., London*, v., Nov., 1897, p. 4.

wall, draws it forwards and fixes it by two silk sutures to the mucoperiosteum of the hard palate. Tilley carries out the same principle by threading the soft palate on both sides with strong silver wire and anchoring it to the incisor teeth. The wires cut out in ten to fourteen days, but by this time considerable healing will have taken place over the raw surfaces from which the adhesions had been separated.* After freeing the soft palate, H. B. Robinson prevents it from again uniting by the following method: "A piece of lead plate is cut the full breadth of the naso-pharynx and bent so that one arm rests on the dorsal surface of the soft palate, and the lower one on the buccal surface, the cut margin being received between the plates and apposed to the bend, and so kept away from the pharyngeal wall." The piece of lead is kept in place by silk threads attached to the four corners, two passing forward through the nostrils and two through the mouth. The lead plate is not removed for a fortnight.† The same principle of treatment is carried out by wearing an artificial-tooth plate with a naso-pharyngeal extension as in Fig. 284.‡

Whatever method is employed to enlarge the stricture, dilatation must be kept up for some time by the frequent passage of the forefinger, a palate hook, or a dilatable bag.

Results.—Stenosis of the passage from the naso-pharynx to the meso-pharynx, and caused by syphilitic adhesions between the soft palate and the posterior pharyngeal wall, is one of the most difficult affections in the neighbourhood to operate on with satisfactory results. The cause of disappointment lies in the low vitality of specific scars and their well-known tendency to contract.

* *Proc. Laryngol. Soc., London*, x., March, 1903, p. 81.

† *Ibid.*, xiv., June, 1907, p. 106.

‡ T. K. Hamilton, *Journ. of Laryngol.*, xx., 1905, May, p. 241.

CHAPTER XLVII

SYPHILIS OF THE UPPER AIR-PASSAGES (Continued)

SYPHILIS OF THE LARYNX

SYPHILIS is met with in the larynx more frequently in men than in women. The primary chancre has been so rarely encountered, generally on the epiglottis or base of the tongue, that it requires no further consideration. The secondary form only occasionally comes under observation. But tertiary manifestations are commonly met with, and the laryngeal changes are of great importance. Postsyphilitic conditions require careful study, on account of their intractability and seriousness. The separation between the several stages of the disease is often not very marked. Thus, perichondritis of the larynx may develop while the secondary rash is still out, and within $2\frac{1}{2}$ months of inoculation.*

Etiology and frequency.—Among the predisposing causes are over-use of the voice, exposure to alcohol and tobacco, and, possibly, vicissitudes of weather. The condition may arise at any age, but is most frequently met with in the third and fourth decades. In the post-mortem room 15 per cent. of syphilitic subjects show the disease in the larynx.† It is not so common in the larynx as in the pharynx.

SECONDARY SYPHILIS OF THE LARYNX

This may occur in the form of erythema (syphilitic catarrh), or of the mucous patch. It seldom comes under observation. Mendel, in six months at the St. Louis Hospital, saw a great number of cases of syphilis, but only met 26 with secondary affections of the larynx.‡ They are less frequent in women. The mucous patch is very rare.

Invasion.—Syphilitic catarrh may appear while the primary sore is still present; or within six or eight weeks; but it is, as a rule, contemporaneous with general secondary lesions. Mendel

* Charters Symonds, *Proc. Laryngol. Soc., London*, iv., March, 1897, p. 55.

† Willigk, *Präger Vierteljahrschr.*, xxiii., 2, 1856, S. 20.

‡ Thèse de Paris, 1893.

concludes that, as a rule, secondary syphilis usually occurs in the larynx between the third and the fifth months from infection. It may only appear after one, two, or three years, and is apt to recur; but a syphilitic catarrh has no characters to distinguish it from an ordinary laryngitis.

Symptoms.—The chief one is a peculiarly painless and persistent hoarseness. Cough and dysphagia are seldom complained of.

Examination.—There is a general dusky laryngeal congestion. If it is mottled in character it is said to be suggestive of syphilis.

Mucous patches are very occasionally seen on the vocal cords or the lingual surface of the epiglottis, and may be followed by slight abrasions. Condylomata are said to occur.

Under treatment these symptoms tend to disappear rapidly, and leave no trace behind.

Diagnosis.—With few exceptions the diagnosis will depend on the recognition of secondary symptoms in the pharynx or elsewhere. When a chronic hyperæmic laryngitis is met with, which does not improve under ordinary remedies, the possibility of a syphilitic basis should be considered, and the Wassermann reaction tested.

Treatment.—The secondary symptoms in the larynx speedily yield to general antisyphilitic treatment (Chap. XLIX., p. 699), combined with the local treatment suitable for laryngitis (p. 491).

TERTIARY SYPHILIS OF THE LARYNX

Tertiary syphilis occurs in the larynx in the forms of (1) gumma, (2) ulceration, (3) perichondritis and necrosis, (4) postsyphilitic induration, and (5) resulting scars and adhesions.

Invasion.—It may appear as early as the second year, or as late as the fiftieth, after infection.

Morbid anatomy.—I. A well-defined, circumscribed gumma is not very commonly met with in the larynx. But it may be found on the epiglottis, as well as in the ary-epiglottic folds, the neighbouring part of the ventricular bands, the arytenoids, or the cords. The surface is smooth, rounded, often irregular, and deep-red or purplish. A diffuse or a nodular gummatous infiltration is frequently met with (Fig. 285). Both these forms may be present together, and neither may come under notice until ulceration has commenced. Gummatous infiltration may take place in limited deposits (Plate xv., Fig. 3, facing p. 468). The epiglottis, the arytenoid area, or some other region may be attacked, or the whole inner surface of the larynx may be infiltrated. This form of syphilitic laryngitis is apt to occur after incomplete treatment, or to follow on repeated laryngeal attacks.

2. **Ulceration.**—The superficial ulcer so frequently met with in the pharynx (Fig. 281, p. 675) is extremely rare in the larynx, but it may occur on the epiglottis. Deep ulceration is always the result of a gumma, or a diffuse gummatous infiltration. It is irregular, punched out, crateriform, with sharp edges, and an inflamed areola. There may be much inflammatory hyperplasia and œdema round about. The base of the ulcer is coated with dirty grey or yellow necrotic slough. When gummata or diffuse gummatous infiltrations break down into ulcers, the latter may run together in an irregular, serpiginous fashion. Ulceration occurs

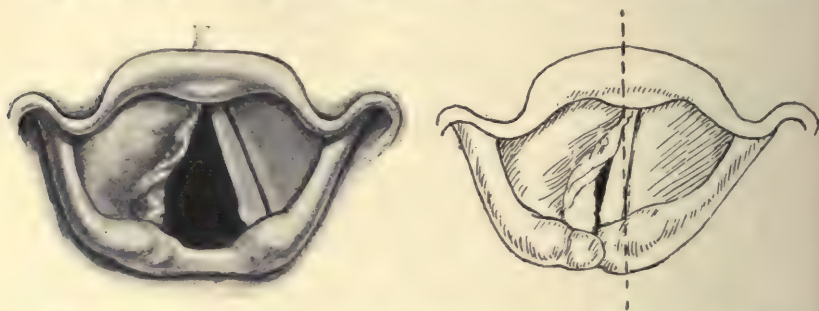


Fig. 285.—Syphilitic infiltration, ulceration, and fixation of right side of larynx.

The right-hand sketch shows the immobility of the right cord, and the compensatory action of the left.

most frequently on the epiglottis, which becomes scarred, atrophied, or entirely destroyed. This may take place painlessly. (Plate xvi. Fig. 3, facing p. 500.)

3. **Perichondritis and necrosis.**—Perichondritis, of syphilitic origin, may primarily attack the perichondrium of any laryngeal cartilage, or it may result from the deep penetration of gummatous ulceration. The latter is the more common. The perichondritis will, of course, vary with the region affected. It may lead to necrosis and exfoliation. Thus the arytenoids may be expectorated, or portions of the thyroid or cricoid may necrose off. The epiglottis is the cartilage most commonly affected. Or the perichondritis may resolve, leaving scar tissue with the unfortunate syphilitic tendency to contract. At the arytenoid joint the process may cause ankylosis, either the true form from adhesive effusion in the joint itself, or false ankylosis from contraction of adhesions around it (Plate xv., Fig. 4, facing p. 468).

4. **Induration.**—It is far from uncommon to meet with a hypertrophic laryngitis of syphilitic origin, yet obstinately uninfluenced by any form of antisiphilic treatment, and tending

to sclerosis and contraction. It has been called parasymphilitic laryngitis (Fournier). It is characterized by a hypertrophic process which may be more or less diffused, giving the larynx a generally infiltrated appearance; or it may be limited to certain regions, the posterior ends of the vocal cords, the arytenoids, and the interarytenoid space being chiefly affected (*see* Plate XVI., Fig. 3, facing p. 500). It is frequently more or less symmetrical. On the cords it may resemble pachydermia (p. 499); and a pachydermatous mass or mound is often found in the interarytenoid space, shading off into the diffuse thickening around the arytenoids.

5. **Resulting scars and adhesions.**—When the epiglottis has been invaded it is not uncommon to see adhesions attaching the front of it to the base of the tongue, or each extremity of it to the posterior wall of the pharynx. The arytenoids and ventricular bands may be left twisted and deformed. A cicatricial web may form between the cords, generally anteriorly* (Plate XVI., Fig. 6). The vocal cords may never recover their flat, even, mother-of-pearl surface. Their thickened, roughened, irregular contour accounts for the frequency with which the voice remains harsh for life. Permanent thickening in the interarytenoid



Fig. 286.—Tertiary syphilis of the larynx.

The larynx, with part of the trachea, has been opened longitudinally from the back. The cavity shows everywhere, with the exception of the upper part, the contracted scars and thickening left by ulceration. The stellate puckering in the region of the petiolus is well shown. At the lower level of the cricoid cartilage, which had evidently been diseased, the destruction of the soft parts and the cartilage has resulted in contraction, producing the ledge which is seen projecting into the subglottic region, and reducing the air-way to less than the size of a pencil. The upper part of the trachea (about $1\frac{1}{2}$ inches on either side) shows the white, glistening, shrunk scars resulting from bygone ulceration. (*St. Thomas's Hosp. Mus., No. 1777.*)

* Samuel Wilks, *Guy's Hosp. Repts.*, ix., 1863, p. 36.

region, or interference with the movements of the arytenoid joint, may also be left (Fig. 286).

Symptoms.—These will present great variety, according to the situation, extent, and severity of the lesion. The voice is generally altered, becoming hoarse and raucous. Its use is not so painful as in tuberculosis. There may be aphonia. Cough is rarely troublesome. Pain is not a marked symptom, except when a gumma is rapidly breaking down. Dysphagia is not a necessary symptom, but becomes marked if a gumma invades the epiglottis or ulcerates deeply between the root of the tongue and lateral wall of the pharynx. Dyspnoea will vary with the degree and invasion of the glottic or subglottic space, and the amount of fixation of the vocal cords. It is liable to increase rapidly when oedema suddenly develops, or a piece of necrosed cartilage becomes impacted in the larynx. It may be suddenly and dangerously increased by exertion, or the administration of a general anæsthetic. Stridor is apt to come on insidiously, and the patient becomes gradually accustomed to his contracted air-way so that he may deny its presence even though it is noticeable when he talks quickly. The stridor is always increased at night.

Remembering what takes place so often in the tongue, it can well be imagined that syphilis in the larynx may be a predisposing cause of tubercle or malignant disease.

Diagnosis.—This is based on the appearances, history, presence of confirmatory lesions elsewhere, and results of treatment. A history of infection, unless positive, may be neglected. It must not be forgotten that a syphilitic patient may have a laryngitis which is simple, tubercular, or malignant. As regards treatment, again, it is well known that some malignant growths will at first improve under antisyphilitic treatment. Besides, a syphilitic lesion in the larynx may coexist with tubercle or with cancer. The Wassermann reaction is therefore helpful, but not conclusive.

From tubercle the differential diagnosis has been pointed out at p. 645, and from malignant disease at p. 526. Partial or complete fixation of the arytenoid joint must be diagnosed from a recurrent paralysis (*see* p. 562, and Table on pp. 562-3). It is well to remember that not only may a syphilitic process produce a myopathic palsy, but it may cause a recurrent paralysis by invading a bulbar nucleus or the nerve anywhere in its course, or by a peripheral neuritis (*see* p. 556).

Prognosis.—This is favourable in all cases which come under treatment in good time. It is only necessary to speak with reserve in regard to the recovery of clear voice. In more advanced cases

the possibilities of rest, care, prolonged treatment, tracheotomy, or operations for stenosis, may have to be kept in mind.

General treatment.—If the larynx is invaded acutely, rest to the voice, by silence, is of much importance, and general rest in bed may also be advisable. The diet should be light, consisting largely of milk. In all cases tobacco, spirits, and liqueurs should be discontinued; light wine or beer may be allowed; but the patient will do better without any alcohol.

Mercurial treatment should be given as soon as possible, although in cases without urgent symptoms, speedy relief can be secured by iodide. The latter drug may produce much irritation, profuse catarrh, and even œdema in some cases of laryngeal syphilis, so that its administration must be carefully watched. If prompt treatment is required, the administration of salvarsan appears to be particularly valuable in syphilis of the larynx. It is often striking to see the rapid relief of symptoms which, formerly, would have required a tracheotomy. The choice of drugs, methods, and doses is given in Chap. XLIX., p. 699.

Local treatment.—In the larynx, as in the pharynx and nose, the general treatment is of the greatest importance. Local measures are often of secondary consequence, but at other times must be prompt and energetic. Unhealthy ulcerating surfaces should be sprayed with an alkaline lotion (Formulæ 8 to 10), or wiped with peroxide of hydrogen (10 volumes) or perhydrol (3 per cent.), and may then be dusted with iodoform, euphén, or other antiseptic powder. Pain and dysphagia may be relieved by insufflations of orthoform, anæsthesin, or morphia (Formulæ 4 and 6). Exuberant granulations may require treatment with the curette, or painting with nitrate of silver (gr. x-xx to 3i), sulphate of copper (gr. xx to 3i), or argyrol (25 per cent.). Œdema may be treated by sucking ice, or by scarification, or it may require a tracheotomy.

Tracheotomy may be necessary if there is decided or increasing glottic stenosis, generally indicated by stridor at night. In many cases, even when this operation is threatened, it will be found to be unnecessary if the patient is kept at rest in bed, and salvarsan is given or mercurial treatment is pushed actively by inunction or injection. In other instances this same treatment through the skin will act much more effectively when complete rest to the larynx has first been secured by a tracheotomy. The wearing of the cannula need not be looked upon as permanent in all cases, for mercurial treatment will sometimes be so effective that the tube can be dispensed with, even after being worn for years. If a tracheotomy does not promptly relieve the breathing it may be

because the trachea and even the bronchi are also involved by syphilitic stenosis. For this reason a tracheotomy should be performed as low as possible.

Treatment of sequelæ.—Attempts at forcibly dilating a stenosed larynx should not be made in recent cases of ulceration, as acute perichondritis might thus be originated. A web of adhesion may be divided, and efforts made to keep the parts separated by dilating from above. Or, after a tracheotomy, we can perform a thyrotomy and excise the obstructing tissue. The cannula is worn for some time, while the cords are kept apart by introducing a plug from below, or by wearing an intubation tube. But for more marked cases this method is of doubtful value.*

Dilatation from the mouth by intubation tubes is painful and tedious. Indeed, the treatment of cicatricial contractions is unsatisfactory. If consequent on extensive perichondritis or necrosis, if the glottis is much contracted by scar tissue, or if the cords are fixed close together, any operative treatment is almost sure to fail, and a tracheotomy tube may have to be worn permanently. The question is further considered at p. 574.

Syphilis of the trachea is considered at p. 589.

* W. Spencer, *Trans. Laryngol. Soc., London*, 1900, p. 62.

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CHAPTER XLVIII

SYPHILIS OF THE UPPER AIR-PASSAGES

(Concluded)

HEREDITARY SYPHILIS

Synonyms.—*Congenital syphilis ; inherited syphilis.*

Inherited syphilis may appear in the secondary or the tertiary form.

SECONDARY MANIFESTATIONS OF INHERITED SYPHILIS IN THE NOSE, PHARYNX, AND LARYNX

Etiology.—Symptoms may be present at birth, but usually appear within from one to six weeks. They may be delayed to the third or even the sixth month.

Pathology.—This is the same as that of secondary syphilis in the acquired form, i.e. erythema and mucous patches.

Symptoms.—Attention is generally called to the condition by the presence of catarrh, generally referred to as “the snuffles.” The infant’s nasal respiration is noisy, or snoring, and owing to the nasal obstruction he is unable to take the breast for any time without letting go to draw a breath. The discharge from the nose may be thin and ichorous, but soon becomes thick, yellow, and blood-stained. Crusts may form and increase the obstruction. Cracks, weeping fissures, and ulcerations radiate from the *alæ nasi*. The nasal obstruction may lead to choking attacks. As the infant cannot suck properly he wastes rapidly (cf. Nasal Obstruction, p. 92).

Examination, owing to the smallness and the obstruction of the nasal chambers, is difficult ; but there is no evidence of actual destruction of cartilage or bone. Yet flattening and broadening of the bridge of the nose takes place. In the pharynx mucous patches and erythema have been noted. The harsh, weak cry suggests that there may be changes also in the larynx.* Tracheotomy for severe dyspnoea has been recorded. Confirmatory signs are found in the appearance of the patient, the wasting, the syphilitic

* G. F. Still, *Practitioner*, July, 1904, p. 94.

eruptions on the buttocks or the soles of the feet, the mucous patches at the corners of the mouth, and the mucous tubercles round the anus. The infant has a wizened, senile look. There is often a dull, earthy-brown coloration, irregular and ill-defined, around the eyes, nose, and mouth. The glands are evident in the neck, axilla, and groin, and the liver and spleen may be enlarged.

Diagnosis.—The condition is a chronic one, and is thus distin-



Fig. 287.—Congenital syphilis. The patient has Hutchinson's teeth, interstitial keratitis, and well-marked saddle-backed nose.

guished from an acute coryza. The nasal obstruction of adenoids may cause the same difficulty in nursing, but the anterior nasal catarrh is not present. The Wassermann reaction may be negative or only feebly positive.

Prognosis.—This must be guarded, on account of the generally feeble vitality of the subject, and the possibility of permanent stigmata being left.

Treatment.—A wet nurse must not be employed, on account of the danger she runs of becoming infected. If the child is unable

to take the mother's breast, he will require feeding with a spoon. The mother should be placed under the influence of mercury. Mercurial treatment to the child is given in the form of daily inunctions of 15-30 gr. of ung. hydrarg. A favourite method is to smear it on a flannel belly-band, from which it works into the skin by the child's own free movements. It must be continued, intermittently, for two or three years. Baths of 1-10,000



Fig. 288.—Congenital syphilis.

Shows the same patient as in Fig. 287, after the nasal deformity had been corrected by one subcutaneous injection of paraffin.

corrosive sublimate are sometimes ordered. If the diagnosis is doubtful, or if for any reason it is desirable to preserve secrecy in regard to the diagnosis, we can order 1 minim of liqueur de van Swieten in a teaspoonful of milk six times a day, rapidly increasing the dose to 20 or 40 drops a day.* Or hydrarg. c. cretâ may be prescribed. The excoriated nostril may be anointed with

* Liqueur de van Swieten consists of a solution of 1-500 perchloride of mercury.

ung. hydrarg. nit. dil., or similar weak mercurial ointment. Due precautions must be taken to prevent infection being spread by discharges from the nose, or by spoons, bottles, or toys.

TERTIARY MANIFESTATIONS OF INHERITED SYPHILIS IN THE NOSE, PHARYNX, AND LARYNX

Etiology.—It is uncertain at what age these appear. They may follow immediately on the secondary symptoms, although they are often not recognized till the age of 3 or 4, or the development of other characteristics at the period of the second dentition. The commonest age for their appearance is puberty, but their onset may be delayed to even as late as the 38th year.*

Situation.—Syphilis, in the inherited form, chiefly affects the nose; it is less common in the pharynx, and it is rare in the larynx.

IN THE NOSE

Morbid anatomy.—The chief form is that of gummatous infiltration, progressing slowly, but leading to destructive ulceration. The alæ nasi and vestibules are thus involved, or the septum and turbinals are invaded. The bridge of the nose may collapse, and the ulceration, followed by sclerosis, leaves behind a condition of atrophic rhinitis (see p. 140). (Figs. 287 and 288.) Perforations of the septum or hard palate are rare, in my experience, but J. B. Ball says that septal perforation is one of the most common lesions of inherited syphilis, and that perforations of the hard palate also may occur.†

Symptoms.—The chief symptoms are nasal obstruction and catarrh. The discharge is muco-purulent, and offensive. The obstruction is caused by the stagnation of discharge, which dries into adherent crusts. These, on being detached, may start a little bleeding. Ulcers and adhesions may occur in the postnasal space, and the pharynx and larynx may suffer in consequence of the atrophic rhinitis (cf. p. 435).

IN THE PHARYNX

Here inherited syphilis differs from the acquired form in its slower progress, and absence of pain and of local symptoms. It generally appears in the form of diffuse gummata with superficial ulceration, and leaves scars and deformities behind.

Diagnosis.—Scrofulous eczema and impetigo may attack the nostrils of ill-nourished children. Lupus is not so common at

* F. Semon, *Lancet*, 1882.

† "Diseases of the Nose and Pharynx," p. 200. London, 1906.

puberty; the site of origin, the tendency to heal in one part and break down in another, the presence of skin lesions, and the absence of marked fetor, will distinguish it. Ozæna has much resemblance to congenital syphilis of the nose. A course of antisyphilitic treatment may help to distinguish them. Lupus in the pharynx and larynx is apt to be mistaken for inherited syphilis. But there are generally signs of it elsewhere—in the nose, or on the gums and skin; there is no surrounding inflammation; and it is found to be healing in parts. The tests of treatment and the microscope may also be required to complete the diagnosis.

In all cases confirmatory traces of infantile syphilis must be sought in the earthy-tinted skin, sunken nose, scars or striæ about the corners of the mouth, pegged and notched upper incisor and canine teeth, the sequelæ of interstitial keratitis, and choroiditis or nerve-deafness. The family history will often help the diagnosis. The Wassermann reaction may be negative in the presence of the disease, or be only feebly positive.

Prognosis is good so far as regards the immediate results of treatment. But the possibilities of residual atrophic rhinitis, or pharyngeal stenosis, must not be forgotten.

General treatment.—This is fully described at p. 699. Inunctions of mercury, and occasional courses of iodide of potassium, may be required according to the symptoms and progress. Tonic treatment is particularly necessary in the hereditary form—iron, arsenic, cod-liver oil, good food, open air.

Local treatment.—In the nose, cleansing measures are most important, and are carried out as directed in the chapter on Atrophic Rhinitis, p. 140). In the pharynx they are of subsidiary consequence and are frequently uncalled for. They will be directed on the same lines as for the acquired form (p. 682).

IN THE LARYNX

Inherited syphilis appears in the larynx comparatively seldom. But it may occur within the first two months of life in the form of perichondritis,* and later in the form of localized thickenings, hypertrophy, ulceration, or perichondritis.

In late hereditary syphilis in the larynx, the various forms of hyperplasia are thus classified by Brown Kelly:—

1. Hyperplasia associated with ulceration, frequently seen as thickening at the periphery of ulcers or scars.

2. Hypertrophic granulations and papillary excrescences, which may or may not be preceded or followed by ulceration: the

* Isidor Frankl, *Wien. med. Woch.*, 1868, No. 69, p. 1129.

condition is most frequently seen on the epiglottis, and resembles lupus.

3. Tumour-like hyperplasia.

4. Diffuse hyperplastic infiltration.

The **symptoms** are the usual laryngeal ones of alteration of voice or speech, and stridor, which may call for tracheotomy.

Examination reveals diffuse, irregular or symmetrical infiltration of the larynx; ulceration may be present or absent, and the infiltrated region may become œdematous, and suddenly cause laryngeal stenosis. The epiglottis may be free, while the arytenoids may be so swollen and pressed together as to reduce the glottis to a triangular chink. Or the whole mucous membrane of the larynx may be uniformly thickened and hyperæmic. Sometimes the vocal cords are thickened, sluggish, and congested, and account for the harsh, dull voice. The cords may also be destroyed by ragged ulceration. Acute œdema may invade the epiglottis, the ary-epiglottic folds, or other parts of the larynx. Sometimes the hyperplasia may be circumscribed in one part of the larynx, while another part shows ulceration or cicatrization.

Diagnosis.—A family history or other signs of the diathesis may be forthcoming, but it is well to remember that no other stigmata may be present, that hereditary syphilis may occur in the larynx in the form of symmetrical hyperplasia, unaccompanied by ulceration, and that the test of treatment may be unavailable, as congenital syphilis in the larynx does not yield readily to specific treatment. The Wassermann reaction may be negative in the presence of the disease, or be only feebly positive.

Prognosis.—Congenital syphilis of the larynx may be an affection of extreme gravity. Œdema and suffocation may occur suddenly. The thickening may be improved and the symptoms relieved by antisyphilitic remedies, but, as with acquired syphilitic laryngitis, the improvement is generally slight, and the hyperplasia is more or less persistent.

Treatment.—Inunctions of mercury and general treatment must be assiduously carried out (p. 699), and iodide of potassium may be required. Tracheotomy may be necessary when the stenosis is marked or œdema is threatening.

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CHAPTER XLIX

GENERAL TREATMENT OF SYPHILIS

Hygiene and diet.—The hygienic and dietetic care of a syphilitic patient is of great importance. Healthy subjects who are well fed, in clean and comfortable surroundings, and able to spend much time in the open air, will make much more certain and rapid progress than the debilitated, dirty, debauched, starved, overworked, or sedentary.*

When possible the patient should be prepared for treatment by a visit to the dentist, so that the teeth may be scaled or filled, and the gums rendered as healthy and firm as possible. Teeth and gums should be well brushed after each meal with a practical powder, such as camphorated chalk, and the mouth rinsed out frequently with an acetate of alum or chlorate of potash gargle (Formulæ 30 and 35). When the gums are sound there need be little fear of stomatitis.

It is well to discontinue alcohol and tobacco. Possibly a little wine or beer might be allowed with meals, but I am certain that smoking retards recovery in all cases, and particularly in secondary affections. Food should be nourishing, varied, and plentiful. The skin must be kept in good order by baths, supplemented, if necessary, by radiant heat, or hot-air baths. The weight of the patient is regularly taken, for it is a good index of progress, increasing when treatment is acting well, and decreasing in unpromising cases. In the latter event the method of treatment must be modified or altered. Sometimes all specific treatment should be discontinued, and a course of tonics of quinine, nux vomica, iron, arsenic, and cod-liver oil substituted.

Much of the success which is obtained by the inunction cures at Luchon, Cauterets, Aix, Harrogate, Aachen, Wiesbaden, and elsewhere is undoubtedly attributable to the simple and regular life, change of scene, open air, and rest from work and worry.† For those who cannot command these favourable conditions, such as hospital out-patients, the improvement wrought by admission to the wards, and a few weeks' rest in bed, is often remarkable.

Prognosis.—The patient should be advised that it may take from two to four years before a lasting cure can be hoped for. Treatment may be controlled by the Wassermann reaction, but this must not be allowed to play too large a part in the therapeutic plan of campaign. One aim is, of course, to secure and retain a negative reaction, but in old-standing cases this is difficult and sometimes impossible. A positive reaction is not necessarily, by itself, a reason for continuing with treatment; nor is a negative reaction by itself sufficient justification for telling a patient he is permanently cured.

* E. H. Douty, *Brit. Med. Journ.*, Feb. 28, 1903.

† A. Lieven, *Laryngoscope*, May, 1898, and May, 1903.

SALVARSAN ("606")

Salvarsan, at the present moment, is generally regarded as most potent in the earlier stages of the disease, but with little or no effect in the late tertiary and in the congenital forms. So far as rhinolaryngology is concerned this opinion accords with our experience of congenital syphilis; but tertiary disease in the nose and throat, which formerly was wont to progress quickly in spite of active treatment with mercury and iodides, will nowadays often yield rapid results when submitted to injections of salvarsan. (Cf. pp. 665 and 691.)

Plan of administration.—In the primary stage neo-salvarsan is given every four days for five injections, and followed by twenty-four intramuscular injections of mercury, divided into three courses during the year, each course consisting of a single injection once a week for eight weeks. (The method of making these intramuscular injections is described on p. 704).

In secondary syphilis nine neo-salvarsan injections are followed by mercury for two years, and in tertiary disease we may adhere to much the same routine in most cases.

Others advise that the salvarsan and mercury are better intermingled in a three-period course, thus : (1) one injection of salvarsan followed by five weekly injections of mercury; (2) one injection of salvarsan followed by five weekly injections of mercury; and (3) one injection of salvarsan. This routine is remembered by the numbers 1, 5, 1, 5, 1. Others, again, give a first injection of salvarsan, then nine weekly injections of mercury, and then a second injection of salvarsan. This ritual is called the course of 1, 9, 1.

The usual dose of neo-salvarsan is 0.75 gm., but the best dose and the most satisfactory method of using the drug are still open to questions, and readers are referred to current literature on the subject.*

ADMINISTRATION OF MERCURY

It was formerly the custom to prescribe mercury only for the secondary stage of syphilis, and iodides for the tertiary. I have pointed out for many years that the rule was not, at any rate, applicable to the disease when it affected the upper air-passages.† Iodides are necessary for promoting absorption of specific deposits; they relieve, often rapidly, but are not curative; mercury must be given in all stages.

METHODS OF ADMINISTERING MERCURY

We have the choice of the following routes: (1) the mouth, (2) inunction, (3) baths and fumigation, (4) intramuscular injection, (5) subcutaneous injection, (6) intravenous injection.

1. **By the mouth.**—*Advantages*: Is clean, convenient, inexpensive, and can be carried out by the patient without extraneous help, and without interfering with his work or habits.

Disadvantages: Apt to interfere with digestion, and cause alimentary

* J. E. R. McDonagh, *Lancet*, Sept. 3 and Oct. 22, 1910.

L. F. Knuthsen, *Practitioner*, Dec., 1910.

Castex and Gerber, *Proc. XVIIth Internat. Cong. Med.*, London, 1913, Laryngol.

Section, Part i., pp. 35-110, and Discussion, Part ii., pp. 129-35.

† *Laryngoscope*, iv., 1898, No. 1, p. 15.

disturbances; sometimes is not absorbed; salivation is not infrequent; in any case it is slow and irregular, and hence the therapeutic effect is tardy and may be much too late for rapidly progressing lesions.

2. **Inunction.**—*Advantages*: Is painless; leaves digestion undisturbed; salivation is very unusual; the drug is introduced steadily, the dose is easily regulated.

Disadvantages: Is a dirty proceeding, involving special under-clothing and regular hot baths; takes time, which the poor cannot give to it; in some cases the mercury is not absorbed; it is apt to cause stomatitis and local eruptions; it is difficult, and in some circumstances impossible, to keep the treatment secret.

3. **Baths of fumigating calomel** are speedy in therapeutic action, but they take time and trouble and involve publicity.

4. **Intramuscular injection.**—*Advantages*: i, The dose is definite; ii, absorption is certain; iii, fewer attendances are required; iv, the method is cleanly; v, there is rapid action; vi, professional secrecy is ensured; vii, costs little in time; viii, does not keep the patient from his daily duties.

Objections: Possibility (i) of sepsis, sloughing or abscess at the site of injection, (ii) of embolus, (iii) of mercurial intoxication, (iv) of mercurial stasis, (v) of local induration without sepsis, or (vi) of causing pain. These objections can nearly all be met by extreme care in preparing the remedy, and strict antiseptic precautions in injecting it. Unabsorbed mercury can be felt as a nodosity or revealed by the X-rays.

5. **Subcutaneous injection** is now abandoned in favour of intramuscular.

6. **Intravenous injection** claims accuracy of dosage, certain absorption, and rapid action. It is almost painless. But it may cause thrombosis, and if the vein is missed there is a good deal of swelling and acute pain. It is a dangerous procedure.

DETAILS OF METHODS

1. **By the mouth.**—The usual drug is 1 gr. of grey powder in a pill. The Committee appointed by the Advisory Board to the Royal Army Medical Corps advocates the following routine: One or two pills are taken three times a day, spread over a period of 21 months, broken up into five courses of three months each, with one month's interval after the first, second, and third courses, and a three months' break between the fourth and fifth course. Jonathan Hutchinson made the course last at least one year without intermission. He gave a pill containing 1 gr. of hydrarg. c. cretâ and 1 gr. of Dover's powder, three times a day after meals; the number of pills is increased, if there is no diarrhoea, to four, five, or six a day.*

Plummer's pill is suitable for long-continued treatment in doses of $2\frac{1}{2}$ gr. twice a day.

Blue pill (pil. hydrargyri) is sometimes given in doses of 1 to 3 gr.

The liquor hydrarg. perchloridi can be given in doses of $\frac{1}{2}$ to 2 drachms.

In cases where we wish to try the effects of specific treatment

* *Practitioner*, Aug., 1904, p. 145.

without the patient knowing it, we can simply prescribe a teaspoonful of "Sirop de Gibert" three times a day.*

The "Liquor Donovanii," in doses of 5-20 minims, can be used in the same circumstances; and it is also a useful method of prescribing arsenic and iodides as well as mercury.

2. **Inunction.**—The ointment recommended for use in the British Army is made as follows :—

℞ Ung. hydrargyri	.	.	.	.	gr. xl
Adipis lanæ	.	.	.	.	gr. xx

Mix thoroughly, and wrap in wax paper, for a single dose. I advise that sufficient ointment for six inunctions be freshly made each week with lanolin and fresh benzoated lard. The ung. hydrargyri can be used, commencing with the dose of 30 gr., and increasing it to 60 gr. when it is found to agree. A warm bath should be taken before each rubbing. If this is impossible, the site of inunction is well washed with soap and water. Suitable areas are the flexor surface of the forearms, the flanks, and the inner surface of the lower thigh. Each of these six areas is used once a week, leaving one day without an inunction. The packet of ointment is spread over the warm, washed skin with a wooden spatula or paper-cutter. The act of inunction should last at least 30 minutes. Under-garments are worn of a quality which will allow of their being burned at the end of a week, as they cannot very well be sent to the laundry.

The course, as recommended for use in the Army, is spread over two years, viz. the first and second courses of 42 daily inunctions with a three months' interval between the first and second, and the second and third. The third course involves 30 daily inunctions, followed by an interval of six months. Then comes a fourth course of 30 daily inunctions, followed by another break of six months, ending up with a fifth course of 20 daily inunctions.†

In some cases the milder and pleasanter oleate of mercury (10 per cent.), in doses of 2 drachms, can be rubbed in twice a day.

3. **Calomel baths** are simply arranged by seating the patient on a cane chair, enveloped (except for the head) with a sheet and mackintosh, and placing underneath the chair a spirit-lamp and saucer on which 20-30 gr. of calomel can be sublimed. The sitting lasts 15-30 minutes. Ten baths are usually given, one every other day.

A local calomel fumigation is given by placing 1-3 gr. in a suitable glass tube, where it can be warmed and the vapour inhaled through the nose or mouth (Fig. 289).

4. **Intramuscular injections.**—Either (a) an insoluble salt of mercury or (b) a soluble one may be used.

(a) The advantages of **insoluble** preparations are that (1) fewer injections are required, and (2) the effects are more lasting.

The dosage varies with (1) the preparation used, (2) the weight of the patient, (3) the resistance of the patient, and (4) the condition under treatment.

Contra-indications : (1) Liver and kidney disease, (2) advanced life,

* ℞ Hydrargyri iod. rubr.	.	.	.	.	gr. i
Potass. iod.	.	.	.	.	ʒiii
Aq. destill.	.	.	.	.	ʒi
Syrup	.	.	.	.	ad ʒiv

† *Brit. Med. Journ.*, April 14, 1906, p. 874.

(3) very carious teeth, (4) cachexia. I have found that injections do not always prevent loss of weight, cachectic conditions, and relapses.

Choice of insoluble salts.—Grey oil is considered the best for ordinary use. Calomel is the most effective, but the most painful.

Grey oil : The preparation most extensively used is Lambkin's:—

Ry	Hydrargyri	.	.	.	.	.	3ss
	Adipis lanæ	.	.	.	.	.	3ii
	Paraffinum liquidum (carbol. 2 per cent.)	ad					3v
	(Hg and fat by weight, paraffin by volume.)						

Dose : 10 minims = 1 gr. of Hg, once a week.

15 minims = $1\frac{1}{2}$ gr. of Hg and corresponds practically to the 10 cm. of Continental writers. Some cases do well on a maximum dose of $\frac{1}{2}$ gr. of metallic mercury per week, and often $\frac{1}{8}$ – $\frac{1}{4}$ gr. is satisfactory (Lambkin).

In preparing this the mercury must be thoroughly mixed; the mercury and lanolin require to be well rubbed together for two hours, and then the liquid paraffin added, and the whole well mixed.*

The scheme of treatment, extending over 22 months, involves a first course of six weeks, with one injection a week; then comes an interval of two months, followed by two more months of treatment by fortnightly injections. After a four months' interval a third course of treatment during two months with fortnightly injections is carried out; after this a six months' interval leads up to the final course, which lasts

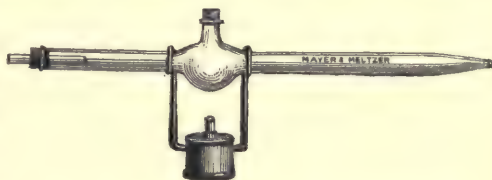


Fig. 289.—Apparatus for subliming calomel.

four months, the injections being made monthly. If each injection be made to contain $1\frac{1}{2}$ gr. of mercury, a total of 27 gr. will have been administered in the whole period of treatment.† The patient should not be lost sight of until he has been at least twelve months clear of all symptoms after the last course of injections.

Calomel injections : These can be prepared as follows :—

Ry	Calomel	.	.	.	.	.	gr. x
	Paraffini liq. (carbol. 2 per cent.)	.	.	.	.	.	3ss

Dose : 10 minims, injected once a week.

Calomel is absorbed very quickly; it is very active; and reaction is more prompt than after any other salt of mercury. But it is intensely painful, and is apt to set up tender swellings and nodules at the site of injection.

One grain of calomel twice a week is given until its physiological effects are apparent, when mercurial cream is substituted (Lambkin).

(b) The following **soluble preparations** are used : (1) Perchloride of mercury, dose $\frac{1}{3}$ – $\frac{2}{3}$ gr. It is slow, unreliable, and causes pain and local irritation. (2) Sozoiodol of mercury, dose $\frac{1}{4}$ gr. (3) Benzoate of mercury. (4) Biniodide of mercury. (5) Salicylate of mercury. (6) Mercury succinimide, in doses of $\frac{1}{10}$ – $\frac{1}{5}$ gr., is probably the best.

* This grey oil is kept ready sterilized in glass ampoules.

† *Brit. Med. Journ.*, April 14, 1906, p. 874.

The course consists of 20 or 30 injections given daily, and this daily repetition of pain becomes irksome. The soluble preparations have the advantage of (1) acting rapidly, and (2) being easily given. The objections are (1) the frequency of administration, and (2) the less lasting effect.

The special indications for the use of soluble preparations are—(1) tubercular subjects, (2) affections of the kidneys or liver, (3) childhood, (4) debilitated subjects.

The technique of intramuscular injection is as follows: The buttock is the most suitable site. To locate the best point, one line is drawn horizontally two fingers' breadth above the great trochanter, and a vertical line is drawn parallel to, and two fingers' breadth outside, the intergluteal fold. Where these imaginary lines meet is a safe spot. The dangerous area lies between the posterior superior iliac spine and the great tuberosity of the femur. The patient may be seated.

An all-glass syringe and a platino-iridium needle (a little longer than the ordinary hypodermic one) are sterilized in boiling olive oil. The skin is thoroughly purified by ordinary surgical measures. The mercurial cream is kept at a temperature of 80° F. by standing the bottle in water at that temperature, and stirring with an aseptic glass rod. The needle is held vertically to the skin and thrust in sharply. The barrel of the syringe is then detached, to make sure that no blood-vessel is injured; if blood escapes, another site is selected. There is no pain in the injection. The puncture is closed with collodion.

Before the next injection, a week later, the site of injection is palpated to make sure that no nodule has formed.

Comparison of dosages.—The following comparison of the dosage of different methods of treatment is of interest:—

One injection of mercurial cream (gr. iss of metallic Hg) = 3 injections of a soluble salt (e.g. $\frac{1}{3}$ gr. of perchloride of mercury in each injection).

One injection of mercurial cream (gr. iss of metallic Hg) = 7 inunctions of ung. hydrarg. (using 20 gr. of Hg daily).

One injection of mercurial cream (gr. iss of metallic Hg) = 21 pills (containing 2 gr. of hydrarg. c. cretâ), 3 pills being given daily.

These equivalents represent energetic treatment for one week.

Selection of methods.—The indications for the selection of one or other method of treatment will depend on (a) the general condition of the patient; (b) the type, situation, and progress of the local symptoms; (c) the effects of previous treatment; (d) the need of reserving the stomach for other drugs—such as iron and arsenic in anæmia, and cod-liver oil and maltine in tuberculosis.

The administration of remedies by the mouth can only be recommended when administration through the skin is not feasible; but it may be used in young and vigorous subjects with mild symptoms; or between courses of more vigorous treatment; or when inunction is contra-indicated on account of bad teeth or inflamed gums.

“Those who prefer the administration by the mouth, of whom

I am one," says Jonathan Hutchinson, "do not do so in the belief that it is more effectual, but simply because it is more convenient."*

The introduction of mercury through the skin is called for in all severe or rapidly progressive symptoms—as they often are when the nose or throat is affected. Inunction, when possible, and well carried out, would seem to be the preferable treatment.† In early cases it acts much better than injections of grey oil.

Intramuscular injection is suitable in cases of malignant syphilis, or when there is intolerance by the skin or digestive tract. It is very suitable for those whose duties would interfere with other methods, and where it would otherwise be difficult to keep the treatment secret.

Intramuscular injection is contra-indicated (1) in patients who cannot be seen once a week; (2) in sensitive patients who dread the puncture; and (3) in those with marked cachexia.

There are also cases in which we have to resort to other remedies in addition to mercury—iodide of potassium, iron, arsenic, and cod-liver oil—when the hypodermic administration of mercury has the advantage of leaving the stomach free for the absorption of these other remedies, and for the abundant nourishment which is so important a factor.

The *dosage and length of course* will be guided not only by the patient's general condition and local symptoms, but also by the history of previous mercurial treatment. No settled system of treatment should be carried out indiscriminately. The site and severity of the lesion, and the general condition and idiosyncrasy of the patient, must be carefully considered. Possibly within the next few years treatment will be checked by repeated control from the Wassermann reaction.‡

Iodide of potassium is not an antidote, as mercury, from recent inoculation experiments, may now be regarded; but it is given because it possesses the peculiar property of promoting absorption of inflammatory products and infiltration. It is more beneficial the later the stage of the disease. It is suitable for virulent cases, or very resistant cases, but is more particularly indicated when they begin to yield. The drug can be given in doses up to 30–60 gr. three times a day in gumma of the nose, threatening perforation of the hard or soft palate, or in laryngeal cases with adequate air-way. It is administered in intermittent

* *Practitioner*, July, 1904.

† Lieut.-Col. H. C. French, *Brit. Journ. of Derm.*, Nov. and Dec., 1908.
H. Wansey Bayly, *Brit. Med. Journ.*, 1910, ii., Nov. 5, p. 1430.

‡ Wassermann, *ibid.*, 1910, ii., Nov. 5, p. 1427.

courses lasting ten days to three weeks, and suitable times are the intervals between the courses of inunction.

One may commence with a small dose, always well diluted. It is generally taken after food, but if given half an hour before meals a small dose will act more promptly than a large one on a full stomach. The addition of ammonia increases the efficacy of the drug, and a mixture with alkalis and nux vomica tends to prevent iodism. In debilitated subjects iodide can be prescribed with iron, quinine, or other tonics (Formula 60). It is often given in a mixture with mercury, so that an iodide of mercury is freshly formed; care should be taken that the iodide is in excess (Formula 61). Patients must be watched for the occurrence of iodide rashes, and nasal or laryngeal catarrh (cf. p. 124). The syrup of hydriodic acid (Gardner) may be found effective in patients who are intolerant of iodides. Iodoglidine—a combination of iodine with the albumin of wheat—is greatly extolled by German authorities. Its slow absorption precludes abrupt flooding of the tissues with iodine. It is given in half-gramme tablets by the mouth.

Iodipin may be used as a substitute for iodide of potassium. A 10 per cent. solution is given internally in gelatin capsules, in doses of 3 to 4 teaspoonfuls daily, or a 25 per cent. solution is given hypodermically in doses of 15 to 20 c.c., injected daily.

Arsenic is a valuable remedy in many chronic cases. As cases of blindness have been traced to the use of arylarsonates, these drugs are not free from danger.

The Zittmann treatment, by sweating and purgation,* is frequently successful in malignant cases, which are not improved, and are sometimes made worse, by mercury and iodides.

* *Practitioner*, Aug., 1904.

CHAPTER I

OTHER INFECTIVE DISEASES

GLANDERS

Definition.—A specific disease caused by the *Bacillus mallei*. It is a rare affection, and is contracted from horses; in them it is not uncommon.

Etiology.—The *Bacillus mallei* occurs in the nasal discharge of infected horses, and grooms are exposed to conveying it on the finger to the mouth or nose. It may also be inhaled, or inoculated through abrasions on the skin, as in laboratory workers. Cases are on record in which it has been conveyed from man to man.

Incubation.—This occupies from three to six days, but the bacillus may remain latent in the tissues for several years before causing a fatal outburst. Relapses may occur after an intermission of five years of apparent cure.

Symptoms.—The disease is marked by fever, malaise, prostration, and pains in the limbs. The discharge from the nose is profuse, purulent, yellowish brown, fetid, and bloodstained. There is swelling of the outside of the nose, and neighbourhood of the lips and cheek, which become red, tender, and erysipelatous-looking. The cervical glands enlarge, and may suppurate. Nodules form in the nasal mucosa, and then break down into ulcers, which destroy the septum and turbinals, and may even invade the sinuses. The process may extend to the nasopharynx and spread to the soft palate, which may be destroyed, or to the larynx, where it causes oedematous laryngitis or destroys the cartilages. The lungs and pleuræ may be invaded.

The disease may be acute or chronic. The latter resembles an ordinary catarrh at first, but the discharge is fetid and sanious; there is crusting in the nose; and later the mucosa is infiltrated and ulcerated. There are various skin lesions, but glanders is generally an acute and rapidly fatal disease, causing death in one to three weeks. It is accompanied by a pustular rash, like smallpox. Delirium, prostration, and coma are marked.

Prognosis.—Some cases of the chronic type may recover. The majority are acute, rapid, and inevitably fatal within four months. A chronic case may end fatally by an acute outburst, or drag on for six or even fifteen years.

Diagnosis.—The initial symptoms might suggest the invasion of pneumonia, acute rheumatism, influenza, enteric, typhus, or pyæmia. The eruption has been mistaken for smallpox, varicella, impetigo contagiosa, herpes zoster necrotica, erythema nodosum, and anthrax. But suspicion should be aroused by the acuteness of the nasal symptoms,

and the fact that cases nearly always occur in those exposed to contact with horses. Diagnosis is very difficult in chronic cases, and most cases are at first treated as syphilitic. The following points must all be taken into consideration: (1) The disease nearly always occurs in those exposed to contact with horses; (2) local symptoms are preceded by an irregular febrile attack of uncertain nature; (3) subcutaneous and muscular abscesses occur; (4) the pharyngeal ulceration strikingly resembles that of syphilis, but there is more ulceration with less infiltration; (5) daily variations of temperature are marked; (6) stigmata of syphilis may be present or absent; (7) laboratory and clinical tests for syphilis will assist. The *Bacillus mallei* is easily detected in the nasal discharge. Diagnostic injections of mallein (Mx-xv) may be employed.

Treatment.—Precautions should be taken by grooms and others who have to approach a horse with glanders. Infection from a human patient must also be guarded against. The treatment can only be symptomatic; attention must be paid to cleanliness, relief of discomfort, and maintenance of the patient's strength. Vaccine treatment might be tried. Of the many drugs which have been employed, mercury is the only one which can claim success with any show of reason.

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LEPROSY OF THE UPPER AIR-PASSAGES

Tubercular leprosy is manifested in the nose and throat by the symptoms of epistaxis, hoarseness, alteration of voice, and dyspnœa.

In anæsthetic leprosy the throat is rarely affected, and not until the disease has lasted at least five years. Then there may develop anæsthesia of the palate and pharynx, with paresis and atrophy.

Infection.—Leprosy is only met with nowadays in this country in individuals who have been exposed to the risk of contagion with lepers. It is important to remember that a patient may return from the East and not develop symptoms of leprosy—at least, not sufficient to attract attention—for ten or more years.*

Invasion.—The disease is very insidious, doubtless because of its painlessness and slow progress. It is thought that the initial lesion of the disease consists of a specific affection of the mucous membrane, usually in the form of infiltration and ulceration on the cartilaginous part of the nasal septum. This is often present in the latent stage of leprosy for years before the appearance of the first tubercles in the skin, or the development of the first nervous symptoms. If nasal catarrh and bleeding are overlooked, the development of a nasal tone in the voice may be the first symptom to direct attention to the air-

* J. B. Ball, *Proc. Laryngol. Soc., London*, Nov., 1893.



Leprosy of the palate, uvula, and fauces. (*See* p. 708.)

passages, although examination may then reveal extensive disease. Just as tuberculosis generally finds its first lodgment in the apices of the lungs, so leprosy most commonly originates in the nostrils.*

Pathology.—The leprosy bacilli are distributed chiefly by lymphatic channels, the intracellular distribution being comparatively insignificant. The so-called "globi" are bacillary thrombi lying in dilated lymphatics, the lepra giant-cells developing from the lymphatic endothelium (Bergengrün). The local symptoms are those of nodular infiltration, ulceration, and subsequent cicatricial contraction. Two or more stages may be concomitant. The early stages may show a reddish and hard-looking thickening, but when it comes under observation it is pale like the anæmia of tuberculosis. The tissues look devascularized, dull, leathery, and in the nose and larynx they suggest the appearance of having been infiltrated with tallow.

Symptoms.—In the early periods of leprosy there is always a chronic coryza, followed by attacks of epistaxis. Many observers look on these as characteristic, and of a diagnostic value analogous to that of hæmoptysis in pulmonary tuberculosis. The nasal secretion is full of leprosy bacilli, and the view is being increasingly held that not only does infection primarily attack the nose, but that it is by contact of fingers contaminated with this nasal discharge that contagion is passed on.†

A diffuse nodular infiltration invades the septum and turbinals and, breaking down, leads to cicatricial adhesions, muco-purulent discharge, crusting, and a condition of atrophic rhinitis. In advanced stages the septum and turbinals are destroyed, and the external nose is retracted. In an early condition the nose may have presented a bilobed, or trilobed appearance.

The hard and soft palates are infiltrated with leprous nodules, which contract into pale radiating cicatrices, holding the palate forwards; and forming the most typical lesion in the throat (Plate XXII.).‡ The uvula is converted into a coarsely nodular or ulcerating mass, or may completely slough away. These changes give the so-called "nasal" tone to the voice. The fauces become nodular or ulcerated; the posterior pillars may become cicatrized to the posterior pharyngeal wall and approximated so that the pharyngeal passage is narrowed.

The tongue is irregular and nodular; the gums may be invaded; and in late stages the mouth may be reduced by cicatrization to a small opening, through which only one or two teeth can be seen.

The larynx is always attacked secondarily to invasions of the nose, fauces, and skin. The favourite site is the epiglottis, especially

* Sticker (Giessen), *Laryngoscope*, May, 1898.

† Jeanselme and Laurens, *Soc. Méd. des Hôp.*, 23 Juillet, 1897.

E. Segura, *Proc. Roy. Soc. Méd.*, Laryngol. Section, Dec., 1910.

‡ StClair Thomson, *ibid.*, i., March 6, 1908, p. 74.

the petiolus, and the region just above and below the anterior commissure of the vocal cords. The epiglottis, the ary-epiglottic folds, and the ventricular bands are also infiltrated, nodular, ulcerated, and contracted. The arytenoids and ary-epiglottic folds may be occupied by two irregular, pear-shaped swellings, with an uneven and nodular surface, and so approximated as greatly to narrow the laryngeal orifice.* The epiglottis is often distorted or curved on itself, wasted to a mere knob, and so contracted that the interior of the larynx is invisible, and the opening leading to it reduced to a small, circular orifice. This condition will markedly alter the voice and render the respiration noisy and stridulous, yet, in spite of extensive disease in the larynx, the vocal cords may long remain normal.† In later stages they ulcerate and partially cicatrize. As a matter of practice, although dyspnoea is a common symptom, tracheotomy is seldom required.

Leptous nodules may also occur in various parts of the larynx, varying in size from a pin's head to a pigeon's egg. They vary in appearance, and may be smooth, or nodular, and sometimes resemble papillomata.

Paul Bergengrün (Riga) states that they are always anæsthetic.‡ The anæsthesia of the surface is characteristic.

Diagnosis.—Leprosy in the air-passages is apt to resemble lupus, tubercle, and syphilis. Cancer is not likely to be mistaken for it. Difficulty in distinguishing it could only occur in the very early stages of the nasal infection, and then the detection of the bacilli in the muco-purulent rhinitis would lead to recognition. Later on, the slow progress, the presence of cutaneous phenomena and anæsthetic areas, would remove all doubt.

Treatment.—Local cleanliness and disinfection must be carried out with warm alkaline lotions and oily sprays (cf. Treatment of Atrophic Rhinitis and Laryngitis Sicca, pp. 145 and 492). A spray of 1 per cent. resorcin and iodoform has been recommended. The similarity of the process to lupus would suggest the use of the galvano-cautery. Tracheotomy may be required.

Great care should be taken to avoid direct or indirect contact with the secretions from the mouth or nose of a patient with leprosy.

For further information readers are referred to special monographs or textbooks of general medicine.

* J. B. Ball, *Proc. Laryngol. Soc., London*, Nov., 1893.

† Arthur Evans, *Proc. Roy. Soc. of Med., Laryngol. Section*, i., Dec. 6, 1907, p. 16.

‡ *Proc. Laryngol. Soc., London*, v., March, 1898, p. 54.

SCLEROMA

Synonyms.—*Rhinoscleroma*; *scleroma of the pharynx and larynx*; *blennorrhœa of the larynx* (Stoerk).*

A rare, chronic, incurable affection, possibly contagious to a certain degree, occurring only in limited districts of the world. Up to the present about 700 cases have been recorded.†

Etiology.—The disease is most commonly met with in Poland, the neighbouring parts of Russia, Galicia, Roumania, Prussia, and also in Wallachia, Silesia, and Moravia (Schrötter). It has invaded the northern districts of Hungary, and, according to von Navratil, has lately spread over the whole Hungarian lowlands.‡ It is also gaining a foothold in Germany.§ Cases are seen in Vienna in patients who have never left the city. It has been met with in South America, the Antilles, Egypt, and India. It is unknown in this country, except in imported cases, of which only two were shown at the Laryngological Society of London in fourteen years.|| Sixteen cases have been recorded in the United States, all in patients coming from some part of Poland.¶

Scleroma affects all classes, but is more frequently met with in those with poor surroundings. Both sexes and all ages are subject to it.

Pathology.—The mucosæ of the upper air-passages are infiltrated by a chronic, progressive inflammation, which rapidly develops into cicatricial tissue. It is not a skin disease (Gerber), but it invades the mucous membrane beneath the lips and nostrils, and so gives a swollen, indurated, and disfigured appearance to these features.

The disease was formerly thought to be caused by a pathogenic organism, the bacillus of Frisch. It is now considered that this is really Friedländer's bacillus,** which we know is found in healthy respiratory passages. The organism doubtless increases to an unusual degree, and may produce secondary changes in the scleromatous tissue. This has no tendency to ulcerate, but generally cicatrizes and contracts into a scar tissue of cartilage-like hardness. The latter shows the presence of hyaline bodies, and a large cell with a homogeneous protoplasm which stains poorly or not at all, and has the general appearance of an enormous fat droplet. This was first described by Mikulicz as diagnostic of scleroma. The affected parts become callous; adhesions result in the form of semilunar bands or diaphragms, and strictures.

Scleroma may produce visible changes in the mouth, the nostrils, the eyelids, or the cheek. The nose is more frequently affected primarily

* "Klinik der Krankheiten des Kehlkopfes," Heft 1. Stuttgart, 1876.

† Von Schrötter, *Lancet*, Sept. 23, 1905, p. 931.

‡ *Journ. of Laryngol.*, xxiii., 1908, No. 5, p. 238.

§ Gerber, *Zeitschr. f. Laryngol.*, i., 1908, Heft 1, p. 102.

|| Payne and Semon, *Trans. Path. Soc., London*, xxxvi. 1885, p. 73.

Dundas Grant, *Proc. Laryngol. Soc., London*, vii., April, 1900, p. 85.

StClair Thomson, *ibid.*, xiv., 1907, p. 65; and *Proc. Roy. Soc. Med.*, Laryngol. Section, vol. iv., Nov., 1910.

¶ W. Freudenthal, *N.Y. Med. Journ.*, Feb. 1, 1896, p. 133.

Emil Mayer, *Laryngoscope*, xviii., 1908, No. 12, p. 964; and *Amer. Journ. Med. Sci.*, Feb., 1909.

J. H. Guntzer, *ibid.*, xix., 1909, No. 6, p. 458.

** F. Klemperer and M. Scheier, *Zeitschr. f. klin. Med.*, Bd. xiv., Hefte 1, 2.

than the naso-pharynx or larynx, to which the disease may spread. But it may originate, and remain more or less limited, in the naso-pharynx or the larynx, or it may be met with only in the trachea.*

Symptoms.—When the nose is attacked, the symptoms are those of painless and slowly increasing obstruction and catarrh, going on to complete stenosis. In the larynx the affection produces catarrh, cough, hoarseness, expectoration of crusts, dyspnoea, stridor, and eventually stenosis. This sequence may be spread over fifteen or twenty years, and the prodromal catarrh may persist for years before the formation of scleromatous infiltration. It is rare for the trachea and bronchi to be affected, except in late stages. The disease is said to have a characteristic smell, similar to that of ozæna.

Examination.—A hard infiltration, frequently concealed by muco-pus or crusts, may be met with anywhere in the nose or naso-pharynx. There is no bleeding or ulceration. The infiltration tends to recur slowly after removal. It may completely block the nose, or form a diaphragm across the naso-pharynx. In the larynx scleroma generally attacks the subglottic area, beginning anteriorly as a subcordal infiltration and spreading towards the interarytenoid region. The tumefaction is at first pale-red in colour, and then white and smooth, and may be connected with the under surface of the cords or separated from them by a groove. Some cases described as “chorditis vocalis inferior” are doubtless scleroma. Diffuse infiltrations, nodules, or gummatous masses may also appear around the glottis, the vestibule of the larynx, or the ary-epiglottic folds, and are rarely unilateral. The stenosis is apt to be increased, and suffocative attacks induced, by the formation of crusts, which are expelled with difficulty. (Plate xvi., Fig. 4, facing p. 500.)

Diagnosis.—The disease has been mistaken for carcinoma or acne rosacea, especially if located in the alæ nasi. It may also require differentiation from syphilis or lupus. The diagnosis is based on the long history, slow development, absence of pain, stony hardness, dry secretion, tendency to recurrence, and the pathological findings of hyaline bodies, Mikulicz cells, and pure cultures of a mucoid, Gram-negative, capsulated bacillus, belonging to the Friedländer group.

Atrophic rhinitis, with concentric narrowing of the postnasal space, would be characteristic of scleroma.

Prognosis and infection.—The prospect of complete cure is poor. The general health may not be impaired, unless stenosis

* Hermann von Schrötter, “Contribution à l'Étude du Sclérome de la Trachée,” *Ann. des Mal. de l'Oreille*, xxvii. 1901, No. 3, p. 221. (Gives a large bibliography.)

becomes marked. The disease progresses slowly, or remains quiescent for years and then again becomes active. Although contagiousness is not proved, the disease has much in common with leprosy, and patients should be warned of the possibility of spreading it.

Treatment.—Very satisfactory results have been obtained by treatment with Röntgen rays (23 gentle applications, each lasting 6 minutes), or radium bromide (7 applications of 60 mg., each lasting 20 minutes).* Otherwise treatment must be symptomatic. Obstructing infiltrations are removed, and the diseased area kept as clean as possible. If the laryngeal obstruction is not relieved in this way, intubation or tracheotomy may be required; but Pieniaczek considers that thyrotomy, followed, if necessary, by methodical dilatation, is the quickest and most reliable method of relief. Tracheal scleroma can be arrested by exposure to Röntgen rays through a tracheotomy wound.† Arsenic is generally given.

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 Klemperer and Scheier, *Rev. Hebd. de Laryngol.*, xxii., ii., 1902, No. 36, p. 290.
 Emil Mayer (*Amer. Journ. Med. Sci.*, May, 1907) epitomizes all the cases published since Pieniaczek's article, and gives one of the fullest studies of the subject in English.
 Emil Mayer, *Trans. Amer. Laryngol. Assoc.*, 28th Congress, 1906, p. 70.

ACTINOMYCOSIS

Actinomycosis of the tonsil is an exceedingly rare affection, which has no clinical characteristics and has generally been discovered accidentally.‡

Actinomycosis of the larynx has occasionally been met with in the form of a painless, hard tumour, generally in the region of the sinus pyriformis and with collateral œdema. It is apt to be mistaken for a malignant tumour, but may be distinguished by detecting a hard cord connecting it with the upper jaw; it is, in fact, an extralaryngeal actinomycosis.§

* Freund and Kahler, *Lancet*, Sept. 23, 1905, p. 931.

† Emil Mayer, *Amer. Journ. of Med. Sci.*, Feb., 1909.

‡ Jonathan Wright, *Amer. Journ. Med. Sci.*, July, 1904.

Arthur Cheate, *Proc. Laryngol. Soc., London*, Nov., 1904.

§ Henrici, *Arch. f. Laryngol.*, 1903, Bd. xiv., Heft 3.

PART IX.—ACUTE SPECIFIC FEVERS IN THE NOSE AND THROAT

CHAPTER LI

THE nose and throat are portals of infection for the majority of infectious fevers; many of them have characteristic manifestations there. In some, like diphtheria, these local developments are of the greatest importance; and even when the infection takes place through the alimentary canal, as in enteric, the complications in the larynx are noteworthy.

These throat complications have often many features in no way characteristic of the fever causing them, and readers are then referred to the chapters on acute rhinitis, pharyngitis, and laryngitis. But some peculiarities are worth referring to, and the conditions incident to each fever will be summarized, while in the case of diphtheria a fuller, but necessarily abbreviated, description of the whole course of the disease seems desirable.

MEASLES

Acute catarrh is a characteristic feature of measles. In the prodromal stage there are dark congestion and dryness of the pharynx and fauces, with an eruption of tiny, red, punctiform or granular spots on the roof of the mouth and the palate. More characteristic are Koplik's spots, which usually appear on the buccal mucous membrane and gums opposite the molar teeth. They are minute white spots with a red areola; they cannot be wiped off; they vary in number from two or three to several hundreds; and are invariably discrete. They appear about the second day, and fade as the rash comes out. Twenty-four hours after the commencement of these prodromal symptoms acute rhinitis occurs, with intense irritation, sneezing, and profuse catarrh. The rash follows this in twelve to twenty-four hours, but may be delayed till the third or fourth day. Meantime the catarrh, photophobia, lachrymation, and general discomfort subside; but with the appearance of the rash these symptoms return with increased severity, and to

them is added fairly acute laryngitis, with soreness, hoarseness, and cough. The laryngitis in children may assume a spasmodic type. In severe cases it may be ulcerative; and in poorly nourished, unhealthy children there may be gangrene of the tonsils or larynx.

Membranous laryngitis may occur, generally as the rash is fading. It is frequently a true diphtheria, and is a serious and often fatal complication.

Paralytic sequelæ are rare in the larynx. The initial rhinitis may linger on as a chronic purulent rhinitis, or degenerate into an atrophic form. Adhesions between the turbinals and septum are not an uncommon sequel (p. 177).

For treatment, *see* the sections on acute rhinitis (p. 124), pharyngitis (p. 427), laryngitis (p. 481), spasmodic laryngitis (p. 482), and diphtheria.

SCARLATINA

A sore throat usually precedes the eruption in scarlet fever by twenty-four or forty-eight hours. Not only is the throat affection, as a rule, the first, but it is the most constant symptom of this disease. The characteristic feature of the scarlatinal sore throat is the bright red injection of the fauces and tonsils, appearing at the same time as the typical "strawberry" tongue. Such a throat and tongue in a patient who has fever, nausea, and vomiting, and whose skin feels peculiarly burning, should always excite suspicion and suggest a keen look-out for the rash. The latter may, however, be so transitory that the diagnosis must be founded on the throat and general symptoms.

The degree of inflammation of the throat in scarlet fever varies from the slightest congestion of the fauces to a severe septic or gangrenous pharyngitis. Three degrees are usually described:

1. Redness and congestion of the fauces, soft palate, uvula, and posterior pharyngeal wall, with swelling of the tonsil and follicular tonsillitis. The submaxillary glands are enlarged, but soon subside.

2. Membranous angina; a yellow membrane forms on the tonsil and fauces, and, spreading rapidly, may invade the nasopharynx, the nose, and the larynx. This angina is apt to occur about the third to the sixth day of the fever; there are a quick rise of temperature, great pain in the throat and neck, rapid enlargement of painful, lymphatic glands, and swelling of the connective tissue of the submaxillary region. The membrane is caused by streptococci, and is distinguished from that of the Klebs-Löffler bacillus by being yellowish and more friable, instead of greyish-

white and tough like wash-leather. When a membrane appears later in the fever, i.e. two or three weeks from its commencement, it is usually true diphtheria, to which scarlatina convalescents are very susceptible.

3. Phlegmonous angina, or scarlatina anginosa. This form may be marked from the beginning, but more frequently arises during the height or subsidence of the rash. It is an acute septic pharyngitis and laryngitis. There is rapid destruction and sloughing of the structures in the pharynx and nose; profuse muco-purulent rhinorrhœa; acute and destructive purulent otitis media; and ulceration and necrosis of the soft palate, fauces, and tonsil.

The larynx is often invaded, with the production of œdema, laryngeal perichondritis, necrosis of the cartilages, and subsequent stenosis. The submaxillary region is swollen and brawny, and there is diffuse septic cellulitis spreading down the neck. This last is a very grave affection, many patients dying between the seventh and tenth day, generally from the profound toxæmia. Although the throat condition may cause dyspnœa and threaten asphyxia, death more commonly results from cardiac failure.

For treatment the reader should consult the several sections on the acute inflammations in the nose (p. 124), pharynx (p. 427), and larynx (p. 481), as well as those on septic sore throat (p. 443) and on diphtheria (p. 722). In septic or gangrenous conditions, freshly made chlorine solution or peroxide of hydrogen (10 volumes) is useful locally, while antistreptococcic serum should be tried.

VARIOLA

Epistaxis may occur in the early stages of malignant smallpox. In the prodromal stage there is a catarrhal condition causing lachrymation, sneezing, and hoarseness, and these early symptoms are liable to be mistaken for those of measles (p. 714). From the third to the sixth day the eruption appears in the nose, hard and soft palate, fauces, and pharynx. It is sometimes seen in the larynx, and even in the trachea. The rash comes out at the same time on the skin and mucosa. The pocks appear in the throat as discrete, white or grey vesicles, which soon break down into superficial ulcers. These may coalesce into larger areas, which may then become coated with a dirty-grey membrane. In the larynx the eruption produces a laryngitis which is not, as a rule, severe; but later on, when the skin eruption has reached its greatest intensity, acute laryngitis with hæmorrhage, œdema, pseudo-membranous laryngitis, perichondritis, necrosis, and severe

dyspnœa may supervene. In the event of recovery, cicatricial contraction may cause stenosis.

In malignant smallpox there may be secondary inflammation of the fauces, cervical adenitis and suppuration, and acute and rapid laryngitis.

Treatment will be suggested by that described for acute pharyngitis (p. 427) and laryngitis (p. 481), or in the sections on acute septic sore throat (p. 443) and diphtheria (p. 722).

VARICELLA

The vesicles of chicken-pox may be seen on the palate, pharynx, and tongue. They are without importance. The larynx is rarely invaded, but in young children the resulting laryngitis might possibly require a tracheotomy.

PERTUSSIS

Epistaxis is not uncommon in whooping-cough, and in the prodromal stage there is generally a diffuse catarrh of the upper respiratory tract. In the severe attacks of coughing laryngeal hæmorrhage may take place, and œdema has resulted. The whoop is due to adductor spasm caused by a neurosis, and is probably purely central. The spasm may be so severe and prolonged that it ends in convulsions and death, and even less severe spasms may culminate in sudden death, as occurs in marked forms of laryngeal vertigo.

ENTERIC FEVER

IN THE NOSE AND PHARYNX

Catarrh of the nose and pharynx is not uncommon in the course of enteric fever, and may extend to the Eustachian tube and middle ear. Epistaxis may occur as one of the early symptoms of invasion, and when nose-bleeding in a young patient is accompanied by headache and rise of temperature it should suggest, amongst the other exanthemata, the possibility of enteric.

The adenoid tissue in the pharynx, as in Peyer's patches, may be affected by typhoid fever. On the tonsils and in the pharynx there may occur white, follicular patches, going on to ulceration and necrosis, and healing without leaving visible scars. Croupous pharyngitis—suggestive of, but not, diphtheria—as well as Ludwig's angina are met with, and are of very grave import. Cicatricial areas, on healing, may cause disfigurement and stenosis.

LARYNGEAL COMPLICATIONS

Frequency.—The proportion of cases in which the larynx is involved is thus given by different authorities:—

Landgraf	. .	11	per cent. of all fatal cases.
Griesinger	. .	26	” ” ”
Kanthack	. .	26	” ” ”
Ouskow	. .	30	” ” ”

Lüning (quoted by Dupuy) estimates the frequency at 3 per cent. from clinical statistics, and 17 per cent. from post-mortem examinations.* These figures show that this complication is frequently overlooked in life, not seldom owing to the semi-comatose condition of the patient, for, as Trousseau pointed out, the affection is especially likely to occur in protracted cases of an adynamic type. In these it is probably one of the causes of death.

Etiology.—It has been pointed out that, with few exceptions, all the recorded cases occurred in young men.† There seems to be no relationship between the symptoms of the fever and the laryngeal complication, nor do these lesions invariably appear during the acute period of the fever. Ulceration usually occurs about the third week, but laryngeal complication may develop during convalescence, even as late as two months after the termination of the fever. The dorsal decubitus is regarded by some as a predisposing factor.

Typhoid ulcers in the larynx may be due to: (1) Fresh infections with pyogenic organisms, acting on debilitated tissues; (2) invasion by the Eberth bacillus, as found by Watson Williams and others in typical typhoid laryngeal ulceration;‡ or (3) mechanical causes, from attrition of the inflamed and infiltrated mucosa.

Symptoms.—The invasion of the larynx in enteric may be insidious, an apparently mild laryngitis being suddenly followed by alarming dyspnoea and spasm. The necessity of examining the larynx is indicated by any huskiness, hoarseness, stridor, metallic cough, dysphagia, or difficulty of breathing.

Examination.—The local changes in the larynx seen in enteric may be those of (1) submucous laryngitis, (2) ulcerative laryngitis, (3) laryngeal perichondritis, (4) paralysis of the vocal cords, or (5) ankylosis of the crico-arytenoid joint. These conditions may overlap one another, and may, rarely, be complicated with oedema. Necrosis, following perichondritis, is the commonest, as it is the most serious, of possible complications of typhoid fever. It most frequently involves the cricoid, and, next to this, the arytenoid cartilage (Fig. 290).

Ulceration comes next in frequency, though some observers

* *Arch. f. klin. Chir.*, xxx., 1884, pp. 225 and 523.

† George Duffey, *Dublin Journ. Med. Sci.*, March 1, 1898, p. 185.

‡ *Brit. Med. Journ.*, Dec. 15, 1894.

say that it precedes and causes the perichondritis. Ulcers show a marked predilection for the posterior part of the larynx. This is because clinical and post-mortem findings prove that true typhoid lesions occupy the areas of adenoid tissue normally distributed in the larynx, at the base of the arytenoids, over the posterior plate of the cricoid, on the ventricular bands, and in the ventricles of Morgagni. The epiglottis, generally on the tip and edges, may also be affected, and sometimes alone. Here it may take the form of a pseudo-diphtheritic membrane.

The true, specific, typhoid ulcer is excavated, with surrounding infiltrating areas, and is especially productive of deep tissue changes. The non-specific ulcer is a superficial lesion, only slightly undermined, with no surrounding infiltration, and causing little destruction in the neighbourhood. Necrosis most commonly attacks the cricoid cartilage.

Paralysis may occur during the fever, or during convalescence. It may be temporary or permanent. The abductor muscles are generally affected, either from peripheral neuritis, or from the pressure of enlarged glands on the recurrent laryngeal nerve (*see* p. 556).

Ankylosis of the crico-arytenoid joint may occur, even on both sides (Delavan). For the appearances of ankylosis, *see* p. 578.

Diagnosis is based on the discovery of the conditions described during the course of enteric, or in the period of convalescence. The possibility of the ulceration being tubercular should be kept in mind (Jobson Horne).

Prognosis.—Laryngeal invasion is always a serious complication of typhoid fever. It is the more so if the condition is not diagnosed and under observation, so that relief can be secured in good time. Of 243 collected cases 65 per cent. died; of those

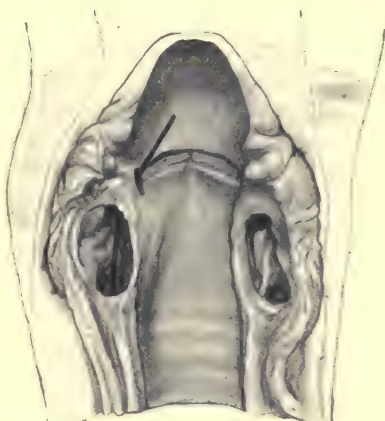


Fig. 290.—Enteric fever of the larynx.

This drawing shows the larynx opened longitudinally from the back. There is an abscess-cavity around the plate of the cricoid cartilage, which is denuded and necrosed. A bristle on the left side indicates how the abscess opened into the laryngeal cavity by an aperture just behind the attachment of the vocal cord to the arytenoid cartilage. On the right side a loose portion of necrosed cartilage is well shown. From a man aged 22, admitted on Dec. 6, 1885, with a ten days' history of illness. He had frequent attacks of dyspnoea, and in one of these died, on Jan. 11, 1886—36 days after admission, and presumably in the seventh week of the disease. (*St. Thomas's Hosp. Mus.*, No. 1,782.)

operated on the death-rate was 58 per cent., and of the unoperated 76 per cent.*

In many cases the paralysis, or destructive process in the larynx, leaves permanent damage there.

Treatment.—More attention than that usually given in enteric to the care of the nose, throat, and mouth might avoid some of the complications described. The catarrh and the epistaxis should be treated as already described (pp. 129 and 110). Laryngitis is met by ordinary cleansing and sedative measures (pp. 481 and 491), but once there are symptoms of ulceration, perichondritis, or stenosis, there should be no hesitation in performing tracheotomy. The tracheal cannula should be inserted before the indications are urgent (p. 775). This is particularly indicated in the necrosis which so frequently follows perichondritis, when the mortality, without operative relief, amounts to 95 per cent. Intubation should be avoided; for in perichondritis or necrosis it causes pressure, traumatism, and interference with the escape of pus and necrotic tissue.

The tracheotomy cannula can be dispensed with afterwards in some cases, in periods varying from seven months to six years; the local infiltration, in the meantime, being assisted in its absorption by small doses of iodide of potassium, or injections of fibrolysin, with attention to local causes of catarrh, vocal and respiratory gymnastics, and visits to Ems, Mont Dore, Cauterets, or similar health resort. If the remaining stenosis is so marked that the tracheotomy tube cannot be dispensed with, the chapter on Laryngeal Stenosis should be consulted (p. 574).

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- J. H. Bryan, *Trans. Amer. Laryngol. Assoc.*, xxxv., 1913, p. 181.
- There are several references in the article by Sir George Duffey referred to on p. 718.

INFLUENZA

Catarrhal affections are no necessary part of an influenzal invasion, although doubtless the infection in all cases enters through the air-passages.

* W. Rieser, *Amer. Journ. Med. Sci.*, Feb., 1908.

In the upper air-tract influenza may cause (1) inflammatory affections, (2) neuroses.

1. **Inflammatory affections.**—Spontaneous epistaxis is an early, though not common, occurrence. Catarrh may usher in the disease, and is indistinguishable from an ordinary acute coryza (p. 124). An acute pharyngitis, with marked tumefaction and more pain than usual, is apt to be persistent and rebellious to treatment. Lacunar tonsillitis and peritonsillar abscess are not uncommon. Acute catarrhal laryngitis and tracheitis are also apt to be very persistent, and—as in influenzal catarrh of the pharynx or nose—capillary oozing of blood may occur. The laryngeal inflammation is often very painful, possibly due to a myositis, and this would explain the paresis of the adductor and tensor muscles of the vocal cords (p. 554) which is often left behind. Œdema of the larynx has been recorded, and acute septic inflammation of the throat may in some cases be a serious influenzal complication.

The invasion of the accessory sinuses by influenza is generally more characteristic. This may follow on the initial coryza, but is more apt to occur primarily, or as a sequela on the subsidence of the malaise, pains, and fever of the invasion, and the patient frequently contributes to it by fatigue or exposure. The "neuralgia" or "frontal headache" of influenza is, in the large majority of cases, due to septic invasion of one or other accessory sinus, not necessarily by the influenza bacillus, but possibly by the pneumococcus, streptococcus or micrococcus catarrhalis.* When the frontal sinus is involved the pain will be chiefly in the forehead, a sort of brow-ague. When the maxillary sinus is invaded, the pain may also be in the forehead, as well as in the face and cheek. In the fronto-ethmoidal cells the pain is referred to the root of the nose, or neighbourhood of the orbit. Influenza invading the sphenoidal sinus may cause a dull pain deep between the eyes, or the pain may be referred to the back of the head or the ear (*see* Acute Sinusitis, p. 245).

2. **Neuroses.**—Anosmia is a very frequent sequela of influenza. Cacoscopia will generally be found to be not a neurosis, but due to suppuration in one of the sinuses. Paralysis of the soft palate has been observed, and some dysphagia may be due to weakness of the constrictors of the pharynx. A condition of hyperæsthesia or anæsthesia is not unusual. In the larynx, paralysis of the tensors of the vocal cords may remain after an influenzal pharyngitis, and adductor paralysis of one or both cords may be due to a peripheral neuritis. The barking, inveterate cough, which is

* StClair Thomson, *Practitioner*, "Influenza Number," Jan., 1907, p. 42.

sometimes a legacy of influenza, may be due to any of the nasal, pharyngeal, or laryngeal causes mentioned.

For **treatment** the reader is referred to the various sections in which the conditions described are fully dealt with (sinusitis at p. 247, pharyngitis at p. 427, laryngitis at p. 481, and neuroses of the nose or pharynx at pp. 190 and 464).

Influenza in a chronic, or apparently recurring, form is very unyielding to ordinary treatment, and is only overcome by raising the general resistance of the patient. Vaccines are generally unsuccessful.*

DIPHTHERIA

Definition.—An acute, specific, infective disease, caused by the Klebs-Löffler *Bacillus diphtheriæ*.

The local lesion is a membranous inflammation, usually in the throat or upper air-passages, although other mucous or wounded surfaces may be affected.

Etiology. Sex.—Diphtheria is said to occur more commonly in females, this preponderance being attributed to the greater risk of contamination from household duties and the more frequent habit of kissing.

Age.—The statistics of notification show the heaviest incidence of the disease between the years of 3 and 5. Between the ages of 5 and 8 children are passing from a condition of high susceptibility to one of relative immunity.†

Local predisposing causes.—Enlarged tonsils and adenoids, chronic diseases of the nose and throat, and mouth-breathing favour infection. Children convalescing from scarlatina, especially in hospital practice, are peculiarly susceptible to invasion by the diphtheria bacillus.‡

Infection is generally by direct contact. It may be inhaled, or transmitted by kissing. It can be carried by drinking or eating utensils, broken food, bedding, clothing, pencils, slates, toys, books, etc. It clings more in damp and ill-aired premises. Milk forms an excellent culture medium for the bacillus, and if infected it may spread an outbreak. A similar affection in cows, cats, pigeons, and turkeys has been looked on as the source of some cases. Schools are a fertile field for disseminating infection.

The season of the year is not without influence, the disease being more common in October and November. A water-logged condition of the soil and dampness favour the occurrence of diphtheria.

The bacillus.—In 1883 Klebs discovered the specific cause of diphtheria, and in 1884 Löffler succeeded in isolating the bacillus and growing it in pure culture. The work of Roux, Yersin, Ehrlich, and Behring in 1889–94 resulted in the discovery of the antitoxic serum.

* Lorenzo B. Lockard, *Trans. Amer. Laryngol. Assoc.*, xxxvi., 1914, p. 181.

† J. Thomas, *Brit. Med. Journ.*, Aug. 27, 1904, p. 431.

‡ Egerton H. Williams, *ibid.*, Dec. 21, 1901, p. 1799.

The bacillus varies in appearance. It is a delicate, long, straight, or slightly curved rod, about the same length as the tubercle bacillus, but twice as thick, clubbed at one or both extremities, and measuring 3 or 4 μ in length. It stains irregularly, Löffler's methylene blue being the best fluid. It is also Gram-positive. Collected by rubbing or rotating a sterile swab on the membrane, it grows on blood-serum and all the ordinary culture media in twelve to eighteen hours in the form of single, white colonies.

The significance of the Klebs-Löffler bacillus in the throats of healthy persons has still to be settled. In the throats of persons who give no history of recent contact with cases of diphtheria the bacilli may be detected in 2·7 per cent. In individuals in attendance on diphtheritic patients the bacillus has been found in 69·7 per cent. In convalescents from diphtheria fully virulent bacilli have been found in the throat for many weeks afterwards, even for ten months.*

Incubation is given by some observers as two to four days, and by others as five to eight days. In rare cases it may be only twenty-four hours.

Symptoms.—The disease is ushered in by headache, malaise, nausea, occasionally vomiting, and a temperature of 99° to 101° F.

The site of infection in most cases, according to Marfan, is probably the pharyngeal tonsil; and long ago Brettonneau held that diphtheria always had a nasal origin. This explains the frequent postnasal catarrh.

Sometimes a sore throat is not even complained of; and hence the importance of examining the throat in all cases of children's ailments.

The false membrane usually occurs on the tonsils, to which it may be limited, or it may spread to the fauces, soft palate, or pharynx. At first a thin film, it becomes raised into a yellowish-white patch, later on turning greyish-brown like wash-leather. It becomes thick and firm, and if detached leaves a bleeding surface on which membrane readily re-forms. It may remain limited to the crypts, when it is apt to resemble lacunar tonsillitis, but more commonly it spreads over the intervening surface of the tonsil. The false membrane may become blackish and putrid, giving out a peculiarly offensive odour, and a sloughing ulcer may result in loss of tissue and subsequent scarring. Slight attacks of hæmorrhage may occur. The neighbouring area is inflamed, swollen, and sometimes cedematous.

The submaxillary and cervical glands are enlarged and tender on both sides, but this is not so marked or so extensive as in acute tonsillitis or septic sore throat.

* G. H. F. Nuttall and G. S. Graham Smith, "The Bacteriology of Diphtheria." Cambridge, 1908.

The general or toxic symptoms may be shown by heart-failure, albuminuria, scanty urine, or vomiting. The pulse may be irregular, even in cases which recover. Prostration is severe and marked in fatal cases; the patient is then restless, cold, collapsed, and may die suddenly from syncope. Consciousness may be retained to the end.

The nose may be primarily affected with ordinary diphtheria, as well as by the chronic type of membranous rhinitis (p. 149). When invaded by extension, or concurrently with the fauces, it generally indicates a severe type of disease. It is not always easy to see membrane in the nasal cavities, although shreds or casts of it may be expelled. The nose becomes occluded with sero-fibrinous exudation, with a purulent, muco-sanguinolent, and possibly offensive discharge, excoriating the alæ and upper lip and containing diphtheria bacilli which are apt to persist for weeks or months, and thus constitute a latent source of infection.

Primary nasal diphtheria is more common in nurslings than at a later stage of childhood. It is then characterized by the absence of symptoms of general intoxication, by a tendency to remain limited to the nasal cavities, and by the prognosis being more favourable. Many cases are indistinguishable from hereditary syphilis, except by bacteriological examination. Every suspected case calls for the administration of 1,000 units of antitoxin.*

But, in addition to nasal diphtheria with membrane formation, a rhinorrhœa may occur as a prodromal symptom. When a transitory as well as an early symptom, it generally indicates a mild attack. But if the nasal discharge is late or persistent, the faucial attack is usually severe.†

Laryngeal diphtheria may be primary, but more commonly it is an extension from the pharynx. It is indicated by hoarse voice and cough, inspiratory stridor, cyanosis, and recession of chest-walls. At first there are paroxysmal attacks of inspiratory dyspnœa, but the interference with respiration tends to become continuous and progressive, being indicated by retraction of the chest-walls, cyanosis, restlessness, cold sweats, collapse, and death by asphyxia or cardiac failure.

The membrane may extend to the trachea and bronchi, and more rarely invades the œsophagus.‡

* Mensi, *Brit. Med. Journ.* Epitome, June 20, 1903, p. 97.

† J. D. Rolleston, *Metropol. Asylums Board's Ann. Rept.*, 1906.

J. D. Rolleston, *Brit. Journ. of Children's Diseases*, Jan., 1912, vol. ix., p. 12.

‡ F. E. Field, *Lancet*, Jan. 19, 1907.

Paralysis usually appears in the third week, but may develop as early as the seventh day or be deferred until the sixth week, but rarely later. It occurs in 10 to 30 per cent. of cases. Paralysis is more likely after a severe than after a mild local manifestation, and it is more frequent and severe in cases in which the nostrils are involved as well as the throat. It is more frequent in children than in adults.* It is generally motor, but may also be sensory (cf. p. 543); The degree varies from slight paresis to absolute loss of power. It is apt to spread. The sphincters are not affected, but deep reflexes are lost, and the muscles waste. It may last six to eight weeks, or longer. The soft palate is usually first attacked, leading to nasal voice and regurgitation of food through the nose. Sensation is impaired, so that the palate can be tickled without exciting any reflex contraction. The palatal paresis is also demonstrated by the inability of the patient to blow out the cheeks or correctly pronounce the word "wrong." In the eye, loss of power of accommodation is due to paralysis of the ciliary muscle. The lower limbs, with loss of knee-jerks, are commonly affected before the arms. The muscles of deglutition may be involved, preventing swallowing, and leading to the stagnation of saliva and a throaty cough to expel it. If the laryngeal muscles are paralysed (*see* p. 537) coughing is ineffective, and the passage of food and saliva into the windpipe may cause broncho-pneumonia.

In a severe case the intercostals and diaphragm may be paralysed. The muscles of the face and tongue, however, usually escape.

Death may be due to respiratory paralysis, or, more commonly, to septic pneumonia. Or it may occur suddenly from heart-failure. If the patient survives, the paralysis is always recovered from.

Diagnosis.—Diphtheria may be very insidious in its onset. As a rule, inspection alone will settle the diagnosis. Whenever possible it should be confirmed by a bacteriological examination; a stained film, direct from the throat, may be examined at once; but it is more satisfactory to take a culture, as the delay of twenty-four hours gives a more reliable report. A negative bacterioscopic report in a suspicious case should not be relied upon unless confirmed by at least one, and preferably two, subsequent examinations. Any discharge from the nose should also be tested bacteriologically.

In follicular tonsillitis the fever is higher, the local discomfort more marked, and albuminuria is not so likely to be met with.

* J. D. Rolleston, *Arch. of Pediatrics*, May, 1913.

The points of difference are indicated by comparison in the following table :—

DIAGNOSIS between

FOLLICULAR TONSILLITIS and atypical cases of FAUCIAL DIPHTHERIA

Sudden onset.	Gradual, and often insidious, onset.
Tonsils enlarged and inflamed.	Tonsils may be chronically, but not recently, enlarged.
Exudation occurs for the most part in spots, usually somewhat cheesy or friable in consistence. Often limited to the openings of the follicular crypts, and the spots rarely coalesce. Exudation hardly ever spreads beyond the limits of the tonsil. May encroach on the pharyngeal wall, but does not extend on to the palate.	Exudation, even if discrete, tends to coalesce with a definite pellicle, or membrane. Membrane rarely limited to tonsillar crypts; apt to extend on to the anterior pillar and down to pharynx. Extension on to palate or uvula not uncommon, and almost distinctive of diphtheria.
Exudation easily removed; does not leave a bleeding surface, and does not re-form.	Membrane adherent, leaves a bleeding surface, and re-forms in a few hours.
Usual for both sides to be about equally involved.	Often more marked on one side than the other.
Glandular enlargement about the same on both sides.	Glands more marked on one side.
Pyrexia greater, from 100° to 104° F. and higher.	Fever moderate, from 99° to 100° or 101° F.
Constitutional disturbance more severe.	In a case sufficiently mild to be mistaken for follicular tonsillitis the general symptoms would be much slighter.
Vomiting uncommon.	Vomiting not infrequent.
Rhinorrhœa and albuminuria are uncommon.	Rhinorrhœa and albuminuria are frequent symptoms.
	Hoarseness, stridor, or a croupy cough are suggestive.
	Paralysis, or cardiac disturbance in a later stage, indicates diphtheria.
Bacterioscopic examination of swabs from nose or pharynx is negative as regards the diphtheria bacillus.	The Klebs-Löffler bacillus present in rhinorrhœa and faucial exudation.

Although the usual appearances and character of the diphtheritic exudation is that of a membrane like wash-leather, still it may be creamy, readily detachable, or even entirely absent. On the other hand, membrane-like exudation may occur in Vincent's

angina, syphilitic ulcers, pneumococcic or streptococcic infections, and in some cases of follicular tonsillitis. The clinical features, confirmed by the presence or absence of the Klebs-Löffler bacillus, will determine the diagnosis. Cases of scarlatina anginosa, in which the rash is delayed or absent, are frequently diagnosed as diphtheria. But they are distinguished from diphtheria by continued pyrexia, restlessness, delirium, extensive inflammation of the fauces and greater swelling. There is no definite membrane, the throat is very painful, antitoxin has no effect, and the patient wastes rapidly.

Cases of mucous patch (p. 674), tertiary ulcer (p. 678), herpes (p. 739), keratosis pharyngis (p. 417), and acute tuberculosis (p. 629) have been brought under my notice with the mistaken diagnosis of diphtheria. Attention to the history and character of these affections, and the negative finding of the Klebs-Löffler bacillus, should prevent any such error.

Diphtheritic laryngitis is distinguishable from the stridulous laryngitis of children by the more sudden onset of the latter (generally at night), croupy cough, voice strong though rough, and variation in symptoms. Diphtheria may at first be slight, but is gradually progressive; cough, which is not marked, is more muffled.

Acute laryngitis may occur in any acute specific disease, such as scarlatina or enteric fever, but especially at the onset of measles. The possibility of mistaking these for diphtheria is avoided by being on the alert for other symptoms, and by always taking a culture.

A foreign body in the throat, when coated over with mucus, has been mistaken for diphtheria.

Prognosis.—This varies with (a) the age of the patient, (b) the virulence of the infection, (c) the site and extent of the exudation, (d) the treatment and the stage in which it is adopted, and (e) the after-care of the patient.

(a) The death-rate is most severe up to 5 years of age. After 15 it is much lower.

(b) An acutely toxic infection may kill a patient from rapid heart-failure.

(c) The more severe the local throat symptoms (abundant membrane, sloughing, oedema, hæmorrhage, markedly enlarged glands, and cervical cellulitis), the more likely is the onset of paralysis or of albuminuria, and the more serious is the prognosis. But a mild throat affection may be followed by paralysis or heart-failure.

Nasal diphtheria is apt to produce troublesome hæmorrhage. Early and transitory rhinorrhœa bears a direct relation to the

mildness of the faucial attack. Faucial cases which are also clinically nasal are more severe than those which are faucial only.

Laryngeal diphtheria is of serious augury. It may produce asphyxia or pulmonary troubles. In an adult it is still more serious. Tracheal and bronchial diphtheria is more common in children, yet the administration of antitoxin with intubation or tracheotomy will save a case, even when the membrane has extended to the bronchi. Antitoxin has reduced the death-rate from laryngeal diphtheria in London from 71·6 per cent. to 36·6 per cent., a reduction of nearly 50 per cent.

Diphtheria in and below the larynx is not so apt to be followed by paralysis as when it is located in the pharynx or nose.

(d) The earlier the case has been diagnosed, so that a sufficient dose of antitoxin may be given, the better is the prognosis. After the fifth day the serum treatment produces little benefit.

The following symptoms render the prognosis more gloomy: Irregular or slow pulse, particularly in the first week; vomiting, diarrhoea, collapse, with cold and pulseless extremities; hæmorrhage; suppression of urine; bronchitis; broncho-pneumonia.

Heart-failure from toxæmia occurs in the first fortnight; later on it is generally induced by strain.

The presence of adenoids or tonsils increases the dangers of the case. In 38 autopsies of diphtheritic patients Cottier found adenoids in 50 per cent.*

The value of the antitoxin treatment is so generally accepted that it is hardly necessary to quote evidence in its support. It has reduced the child mortality in London from 30 to 10 per cent., in New York City from 30-40 per cent. to 12-14 per cent., and in Paris from 45 to 12-15 per cent.

Antitoxin treatment.—Antitoxin should be given as early as possible, and in an efficient dose. Statistics abundantly prove that the death-rate increases in exact ratio to the delay in administering the remedy. When given in the first twenty-four hours of the disease the death-rate does not exceed 5 per cent., and is frequently nil; if not given before the fifth day the mortality averages 12 to 20 per cent. Early administration of antitoxin also diminishes the risk of development of paralysis, and this, if it does occur, is then only of a very limited and harmless extent. It also prevents the spread to the larynx. As to dosage, there is some diversity of opinion between those who recommend a massive dose, and those who advise that in cases of moderate severity only a moderate dose should at first be given, and be repeated if necessary. Not less than 2,000 units should be injected for a

* Quoted by J. D. Rolleston, *Med. Press*, July 3, 1907, p. 10.

dose, in any case. It is pretty generally agreed that it is more efficacious to give one large dose as early as possible, instead of a number of small doses at intervals. Hence it is well to start with an injection of 4,000 to 6,000 units, repeated every twelve to twenty-four hours, according to the urgency of the symptoms, until such time as the membrane shall have become definitely shrunken and be obviously separating. The milder cases will, therefore, usually receive a couple of doses, and occasionally but one, whereas in severe attacks the number of injections given will be from three to five. Still, since 1908, the dosage has tended to rise, and it is now held that any case of diphtheria, however mild, should receive not less than 10,000 units; if both tonsils are covered with exudate of one or two days' duration, the dose is 30,000 to 60,000 units; if, in addition, the palate, uvula, and nose are involved with an exudate of three or more days' duration, the dose is increased to from 150,000 to 300,000 units. Nasal cases receive 20,000 units, and up to 50,000 and 150,000 if there are marked symptoms of toxæmia. Laryngeal cases should be given from 30,000 to 45,000 units.* No regard should be paid to the age or size of the patient, the dosage being guided by the urgency of the symptoms and the stage at which the treatment is commenced.†

In suspicious cases it is advisable to administer a moderate dose of antitoxin while waiting for the bacteriological report, when a second and, if necessary, a larger dose can be given if the report is positive. Valuable time should not be lost by waiting twenty-four hours for a report.

There are no contra-indications to the administration of antitoxin, not even the presence of acute or chronic nephritis. But in the case of an asthmatic individual we must remember the serious risk to the lungs entailed by antitoxin. If the attack of diphtheria is severe, and especially if the larynx is involved, we must take the risk, for, happily, it is not every asthmatic who is supersensitive to antitoxin.‡

Method of administration.—The flank between the crest of the ilium and the last rib, or the neighbouring part of the lower abdomen, is generally selected. The skin is well cleansed with soap and water, and then with 1-20 carbolic lotion. The syringe must be well washed and boiled before use. The physician sits on the edge of the bed, on the patient's right hand, and facing towards

* Cartwright Wood and Sims Woodhead, *Metropol. Asylums Board's Ann. Repts.*, London, 1908-12.

Samuel S. Wood, *Journ. Amer. Med. Assoc.*, Sept. 4, 1914.

† E. W. Goodall, *Brit. Med. Journ.*, Oct. 8, 1904, p. 896.

‡ E. W. Goodall, *ibid.*, Feb. 11, 1911, p. 292.

his feet. If he leans across the child, resting the left elbow on the bed on the opposite side, the child is not alarmed by seeing the procedure, and the injection can be carried out steadily. It is made subcutaneously, and should be done slowly. The puncture is afterwards closed with collodion. Intramuscular injections have largely superseded subcutaneous in German and other hospitals. The outer side of the thigh is painted with a 2 per cent. solution of iodine, and the needle is driven deep into the vastus externus muscle. The advantages of this method are that it is as simple as the subcutaneous method, while it is less painful and irritating and ensures more rapid absorption.*

Complications of antitoxin treatment.—Among these are urticarial or erythematous rashes, arthritic or muscular pains, occasionally attended with effusion into the joints, pyrexia, albuminuria, and sloughing, bruising, or abscess at the site of injection. These complications are not of moment, and most of them are avoided by careful antiseptic precautions. There does not seem to be any ground for attributing paralysis to the use of antitoxin; on the contrary, it has been demonstrated that the antitoxin, if given early enough, protects against the paralyzing substance.

Local treatment.—It is unnecessary to worry the patient with strong antiseptic gargles or paints. The mouth and air-passages are kept as clean as possible, while the separation and expulsion of discharges is facilitated. The throat should be syringed (p. 60) every three hours with a warm alkaline lotion (Formulae 29, 30), and the same lotion may be sprayed or snuffed through the nostrils. The teeth and gums are brushed after each meal with some such powder as camphorated chalk, and some antiseptic lozenge such as formalin may be sucked between whiles. If there is sloughing or gangrene, peroxide of hydrogen (10 volumes) or perhydrol (3 per cent.) may be used for wiping out the throat, or for adding to the throat lotion.

When the larynx is affected the steam tent is strictly avoided (p. 60).

In very septic throats—those which are putrid—the best local treatment is an acid solution of chlorate of potash containing free chlorine. This is prepared by pouring 5 minims (0·3 c.c.) of strong hydrochloric acid on to 9 gr. (0·6 c.c.) of powdered chlorate of potash, and shaking up with an ounce (30 c.c.) of water gradually added. This is mixed with an equal quantity of hot water, and used for syringing the throat every two to four hours.

General treatment.—The patient is kept in bed, in a freely ventilated room, carefully isolated, with the usual precautions

* J. D. Rolleston, *Brit. Journ. of Children's Dis.*, xi., July, 1914, pp. 289-97.

against spreading infection, and fed according to the symptoms. If there is any irregularity of the pulse, or sign of heart-failure, absolute rest is strictly enforced and all causes of strain are carefully guarded against. In all cases, rest in bed should be continued for three weeks, and longer if there is any irregularity of pulse.

Alcohol, strychnine, and digitalis are held in reserve for collapse and those cases where cardiac failure persists or is due to strain. Vomiting is met by rectal feeding.

Paralysis calls for absolute rest. When the pharyngeal muscles are affected, fluid nourishment should be thickened and swallowed slowly, or given through a nasal tube or per rectum. Massage and electricity are helpful to restore the tone of the muscles. In all severe cases, particularly in cardiac paresis and paralysis of the pharynx and diaphragm, adrenalin is of service, either by the mouth or subcutaneously, in doses of 1 to 3 drops.

Prophylaxis.—Referring to the section on etiology, it is evident that precautions should be taken in regard to sanitation, milk, and contact with suspected individuals or animals.

A prophylactic injection of antitoxic serum is recommended in large families and schools, should an outbreak occur. The dose generally recommended is 2,000 units, but the Lister Institute suggests 250 units, i.e. 1 c.c. of the antitoxin. Some authorities with large experience are quite averse to using antitoxin as a routine prophylactic, as being both unnecessary and unjustifiable, and only approve of it in suspected cases of laryngeal diphtheria.*

The infectivity of the aural and nasal discharges must not be forgotten. This is a point somewhat neglected.

Isolation should not be relaxed until swabs from the nose and throat taken on successive days show the absence of true diphtheria bacilli. All "contacts" with diphtheritic cases should be swabbed before being allowed to mix with the general population. The Hoffmann pseudo-diphtheria bacillus may be disregarded.

The bacilli are apt to persist in the throat of a convalescent for eight to twenty-four days after the disappearance of the exudation. In a fair number of cases they are found to persist for six weeks, in some cases eight weeks, and in exceptional instances for as long as three months after the attack. The longest time on record is 363 days.

The presence of adenoids appears to be often responsible for undue persistence of the diphtheria bacillus. But these growths should not be operated on before the naso-pharynx is free from bacilli.

To curtail the period of potential infectivity of people harbouring diphtheria bacilli in their throats, the usual sprays, gargles, and paints are useless. The fauces should be well syringed three or four times a day with chlorine solution (p. 60). This strong solution cannot be employed in the nose, where we must be content with the ordinary warm alkaline lotions (p. 56). Open air and freely ventilated and well-lighted rooms will shorten the period of quarantine. Tonsils, if present, should be enucleated, and adenoids should be removed. It has been recommended to spray the nose and throat of "contacts"

* E. W. Goodall, *Brit. Med. Journ.*, Feb. 11, 1911, p. 292.

with a bouillon culture of *Staphylococcus pyogenes aureus*. The treatment is said to be harmless and to be effective in destroying the Klebs-Löffler bacillus in these carriers in from two to seven days.*

The injection of antitoxin does not hasten the disappearance of the bacilli in those acting as hosts. But it should always be given, without exception, in the case of an infected "contact" who presents any indication, however slight, of either faucial, nasal, or laryngeal inflammation (F. Foord Caiger).

Recent views tend to disregard the continued presence of the bacillus in convalescents or "contacts," unless its virulence is proved by animal experiment.†

Intubation and tracheotomy.—In cases of laryngeal diphtheria the question of relief by either intubation or tracheotomy will require consideration. Intubation is described on p. 768, and tracheotomy on p. 775.

Indications.—So far as laryngeal diphtheria is concerned, resort to one or other of these measures should not, now that we possess antitoxin serum, be reserved as a last resource for threatened asphyxia. We do not nowadays postpone relief until there is stridor, retraction, cyanosis, or suffocative attacks. One or other operation is called for if the dyspnoea is marked, if there is commencing retraction of the chest, and if the patient shows signs of restlessness, sweats, collapse, and cardiac failure, which often accompanies even slight forms of laryngeal obstruction.‡ A superfluous tracheotomy does no harm; if deferred too long it may succeed in relieving respiratory obstruction, but yet fail to save the patient.

Intubation for diphtheria is extensively practised on the Continent and in America, but in this country it has not met with general acceptance, remaining limited to the practice of experts in hospitals for infectious diseases.

The *advantages* claimed for *intubation* are the following:—

- Can be rapidly performed (by experts).
- No anæsthetic or preparation required.
- Consent of parents readily given.
- Respiration is continued through natural channels.
- No wound requiring attention and risking infection.
- Simple and short after-treatment.
- Absence of scar.

The *disadvantage* of *intubation* is that it requires the tactile experience and skill only obtainable by special training and frequent practice; otherwise intubation may lead to:—

- Interference with respiration, when tube is not inserted rapidly.
- Passage of tube into œsophagus, thus pressing on the larynx and interfering with deglutition.

Injury to larynx from bungling attempts at introduction.

The forcing of membrane into the trachea, in front of the tube, increasing the respiratory obstruction and calling for immediate tracheotomy.

* Page, *Arch. of Inter. Med.*, Jan. 15, 1911.

J. D. Rolleston, *Brit. Journ. of Children's Dis.*, x., July, 1913, p. 298.

† Discussion at the Annual Meeting of the Brit. Med. Assoc., *Brit. Med. Journ.*, Aug. 28, 1909, p. 517.

R. T. Hewlett, "A Manual of Bacteriology," 3rd ed. London, 1908.

‡ A. O. Bisson, *Lancet*, Jan. 26, 1907, p. 218.

A secondary tracheotomy is required in 25 per cent. of intubation cases. Even when skilfully introduced, the intubation tube possesses the following disadvantages :—

Swallowing is difficult, and the patient either fails to take sufficient nourishment, or requires feeding with a nasal or rectal tube.

Liquids—food, mucus, saliva, and discharges from the nose and throat—frequently pass through the tube and may cause broncho-pneumonia.

The tube may get blocked.

The tube may be expelled, and the patient asphyxiated before it can be reintroduced.

It may cause ulceration, with immediate septic results, and the more distant possibility of stenosis.

It may be coughed up and swallowed.

Or it may pass through the glottis and become impacted in a smaller bronchus.

The *advantages of tracheotomy* are these :—

It is an operation which is well within the province of every practitioner.

If performed in good time, as it ought to be, it is free from the hurry and anxiety which used to be associated with the operation when done *in extremis*.

It can be performed painlessly and calmly under cocaine (see pp. 76 and 776) or light chloroform anæsthesia. Patients who are old enough to compare and express their experiences much prefer it to the distressing feeling of intubation.

Once successfully performed, a tracheotomy relieves a patient of the danger of asphyxia, as the inner tube can easily be cleaned and replaced by the nurse.

Pieces of membrane are more easily expelled or extracted through a tracheotomy wound than through an intubation tube.

The larynx gets complete rest.

The *disadvantages of tracheotomy* have already been indicated, and the risks and complications associated with it are described at p. 780.

The conclusion which this comparison points to is that tracheotomy is indicated in private practice. In hospitals, where constant medical attendance is assured, intubation is preferable. In hands equally skilled at both operations the success of intubation is more marked.* In country practices it would be well to intubate every case of laryngeal diphtheria as soon as it is diagnosed, provided that obstruction is not very marked, in which case tracheotomy will be safer. Tracheotomy gives better results in rickety children.†

Cases unsuitable for intubation.—These are severe involvement of the fauces and nasal passages, œdema of the larynx, suspicion of membrane low down in the trachea, moribund condition from obstruction (which might be dangerously increased by temporary blockage), broncho-pneumonia.

After-treatment: intubation.—The intubation tube should be removed as soon as possible, generally on the third day. In most

* E. W. Goodall, *Brit. Med. Journ.*, Oct. 8, 1904, p. 896.

John H. McCollom, *Boston Med. and Surg. Journ.*, clii., 1905, No. 22, pp. 621-630.

† Comba and Simonetti, *Wien. med. Blätter*, 1899, No. 37.

cases it is not necessary to replace it. Its presence generally requires the feeding of the patient through a nasal tube, but I have found that children, even as young as 4, may learn to take nourishment in the Wolfenden position (p. 650).

Tracheotomy.—A tracheotomy should be performed as low down as possible. In most of the cases in which it is found impossible to dispense with the tube, owing to cicatricial stenosis above it, the operation has been performed so hurriedly that the cricoid is divided, and sometimes even a laryngotomy has been done instead of a tracheotomy. The cricoid cartilage should never be divided, and even the first ring of the trachea should be spared. It is easier to keep the wound in the neck aseptic the further it is removed from the larynx.

The inner tube must be removed frequently (about every hour) and cleansed by boiling in warm soda-and-water. The outer tube is not removed for cleaning for the first three days, unless it is necessary to inspect the windpipe and lift out any semi-detached pieces of membrane.

Considerable difficulty is sometimes met with on attempting to dispense with the tracheotomy tube, the child becoming cyanosed and struggling for breath. This possibility is increased, as already observed, the nearer the wound in the trachea approaches the larynx. It may also be due to the softened aditus ad laryngem of a child being sucked in on the resumption of the normal air-way. It is frequently the result of pure nervousness. The effort should therefore be made to dispense with the tube soon after the third day. The orifice of the cannula should be quietly corked up at night, to see if the child can carry on respiration through the glottis.

If there is stenosis above the wound it may be necessary to move the tracheotomy tube to a fresh opening lower down the neck, or to wear, in addition, an intubation tube for a time.

Permanent stenosis of the larynx and trachea is studied at p. 574.

PART X.—THE NOSE AND THROAT IN SOME GENERAL AFFECTIONS

CHAPTER LII

GOUT. RHEUMATISM. MYXŒDEMA.
ACROMEGALY. ANGIO-NEUROTIC ŒDEMA.
HERPES. PEMPHIGUS. EXUDATIVE ERYTHEMA

GOUT

THE word "gout" is still too often the refuge of the scientifically destitute. It is frequently applied, without sufficient justification, to granular or lateral pharyngitis, chronic lacunar tonsillitis, or catarrhal and spasmodic laryngitis. A patient may have the gouty diathesis, but this, although it would justify suspicion, does not necessarily mean that every trouble in his air-passages is of the same nature.

In the chronic form gout may appear as a general or lateral pharyngitis (p. 428), with marked local discomfort and pain shooting up to the ear. There may be much thick, tenacious phlegm, with great irritability and tenesmus in the throat; the uvula may be thickened and flabby, and small tophi may be detected below the mucosa, or concretions of urate of soda may be discharged from the surface.

In the larynx, gouty concretions may occur in the crico-arytenoid joint, causing ankylosis (p. 578), or take place in a vocal cord, simulating malignant disease. Deposits of urate of soda may occur in the submucous tissue over the crico-arytenoid joint, while the surrounding tissues and the articulation itself remain quite unaffected.*

Acute gout in the pharynx is characterized by (1) sudden, acute invasion and rapid subsidence; (2) sharp fever, and marked general symptoms; (3) intense local pain, almost out of proportion to the visible lesions; (4) symptoms which resemble those of a peritonsillar abscess, but tending to invade the palate and pharynx

* St. Bartholomew's Hosp. Mus., No. 1611A; and Norman Moore, *Trans. Path Soc., London*, xxxiii., 1882, p. 271.

generally, or spread down to the larynx; (5) essentially inflammatory character, giving the throat a deep-red, congested look, with swelling of the faucial pillars and soft palate, flabby uvula, and tumefaction of the posterior pharyngeal wall; (6) complete absence of membranous exudation; (7) no affection of the glands at the angle of the jaw; (8) no suppuration.*

Diagnosis.—This can only be positive when typical gouty accumulations are discharged, or when an acute angina suddenly subsides to be replaced by a typical invasion of one of the joints. It may be suspected when one of the chronic conditions described occurs in the second half of life in men who eat and drink unwisely, or give a personal or family history of podagra.

Treatment.—The local treatment will be cleansing and soothing, as indicated by the symptoms in the pharynx or larynx (*see* pp. 428 and 488). The general treatment will be that suitable to gout and the patient's constitution—colchicum, salicylate of soda, alkalis, and purgatives. Diet and hygiene will require attention. In laryngeal cases, tobacco, spirits, and vitiated atmosphere must be carefully avoided. In chronic cases, relief will be procured by a visit to Harrogate, Bath, Strathpeffer, Carlsbad, Marienbad, Vichy, Homburg, Ems, Contrexéville, Aix-les-Bains, or other spa indicated by the patient's general symptoms.

RHEUMATISM

The relations of rheumatism to epistaxis (p. 110), tonsillitis (p. 367), and ankylosis of the crico-arytenoid joint (p. 578) have already been referred to.

There are no symptoms to distinguish rheumatic affections of the upper air-passages, though a rheumatic cause is often suspected in patients with this diathesis when there is much pain or stiffness, when there is successive invasion of joints, or when the symptoms are speedily relieved by antirheumatic remedies.†

The diagnosis of a rheumatic ankylosis of the crico-arytenoid joint, or of a palsy from the same poison, should not be made until every other possible organic cause has been excluded.

MYXCEDEMA

A patient affected with this disease may, in the first instance, consult a laryngologist with complaints of snoring, pharyngeal catarrh, and thick, slow, drawling and fatiguing speech, which is curiously

* Lermoyez, *Ann. des Maladies de l'Oreille*, 1902, No. 5.

A. Thost, *Arch. f. Laryngol.*, Bd. xxvi., Heft 2; and *Journ. of Laryngol.*, xxviii., 1913, No. 1, p. 54.

† StClair Thomson, *Practitioner* (Rheumatic Number), lxi., 1901, p. 35.

P. Watson Williams, "Rheumatic and Gouty Affections of the Throat," *Laryngoscope*, iv., 1898.

toneless and colourless. The patient may also refer to gain in weight, dyspnœa, irritability, nervousness, loss of memory, and dry skin. Examination may show nothing abnormal in the nose, or there may be hypertrophy of the inferior turbinals.* The tongue may be swollen, and tend to protrude between the teeth; the uvula and soft palate are symmetrically thick and swollen. The mucous membranes generally are pale and flabbily thickened, and the larynx is anæmic and œdematous-looking. There is no loss of sensation or motion. The other characteristic symptoms of myxœdema will be noted.

Treatment with thyroid-gland preparations brings about rapid relief of both local and general symptoms.

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F. Semon, *Internat. Centralbl. f. Laryngol.*, Mai, 1887.

S. Moritz, "On the Oral, Laryngeal, and Nasal Symptoms of Myxœdema," *Med. Chron.*, xlvii., 1907, p. 158.

ACROMEGALY

As part of this affection the bony framework of the nose becomes enlarged, and there is considerable hyperplasia of the mucous membrane, so that the tongue is enlarged, the tonsils hypertrophied, and there is thickening of the uvula, soft palate, fauces, and turbinals. The larynx enlarges, and its mucous membrane becomes thickened, especially over the epiglottis, ventricular bands, and arytenoids, and the voice is deeper and rougher. The glottis may be encroached on, leading to stridor, dyspnœa, and sudden death.†

ANGIO-NEUROTIC ŒDEMA

Synonyms.—*Quincke's œdema*; *wandering œdema*; *acute circumscribed œdema*; *urticaria tuberosa, nodosa*, or *gigans*.

Manifestations of this curious skin affection sometimes involve the upper respiratory tract, and owing to their alarming and possibly dangerous symptoms they are deserving of consideration.

Etiology.—There is generally a marked family history of the disease, or of asthma or allied disorders, and the patients are usually of a neurotic temperament. Attacks are caused in different individuals by different causes: cold, traumatism, worry, mental excitement, fright, or certain foods or drugs. The condition has been mistaken for manifestations of gout or rheumatism.

Pathology.—The affection is regarded as a vaso-motor neurosis in which acute circumscribed non-inflammatory swellings of the skin and mucous membranes occur without warning or apparent cause. In one post-mortem a series of transverse sections of the larynx showed that the œdema affected not only the mucous membrane but the deeper connective tissue, and even the substance of the muscles. This latter condition would prevent the abductors from causing that physiological enlargement of the aperture during inspiration which is so important in ordinary respiration. The œdematous fluid

* Connal, *Glasgow Med. Journ.*, Oct., 1898.

† W. F. Chappell, *Journ. of Laryngol.*, x., 1896, No. 3, p. 142.

was purely of the serous variety, untinged with the colouring matter of the blood; and, contrary to what is usually stated to be found in œdema of the larynx, the tissue covering the true vocal cords was decidedly affected.*

Symptoms arise very suddenly, while the patient is asleep or awake, and are chiefly due to the mechanical obstruction they set up. When they occur in the nose there is sudden obstruction, but without excessive sneezing or discharge. In the throat the symptoms consist of sudden occurrence of great difficulty in respiration or deglutition, associated with much discomfort and sensation of swelling. The discomfort or sense of suffocation may be so oppressive that the patient is seized with the fear of impending death. In the larynx it constitutes an urgently serious condition, and death may occur rapidly. As a rule, after lasting a few minutes, or hours, the symptoms gradually subside and the swellings speedily disappear.

Examination.—(Edematous, non-inflammatory swellings will be seen in the nose, on the palate and uvula, or the ary-epiglottic folds. In a fatal case there was intense œdema involving the epiglottis, the ary-epiglottic fold, and the false and true cords, the ventricle being obliterated. Above the true cords the œdema was most intense, and below them there was none (R. S. Morris). Confirmatory symptoms will generally be found on the skin.

Treatment.—Adrenalin chloride in a spray should be applied every hour in milder cases, and scarification of the pharyngeal and laryngeal swellings in severer attacks. An immediate tracheotomy may be necessary if the dyspnœa is threatening. Some patients wear a tracheotomy tube permanently, keeping it corked between the attacks. Halsted says that ice is contra-indicated as possibly increasing the œdema, but that brisk friction of the skin to produce an attack of urticaria might be tried on theoretical grounds. Mental and physical rest is important, and saline laxatives and alkalis should be given internally.

Halsted suggests that, as similar œdematous swellings occur in the brain, kidneys and elsewhere, the sudden deaths following the injection of antitoxin may be attributable to this condition, and that therefore the serum should not be used as a prophylactic where the family history suggests erythematous tendencies.

* T. Wardrop Griffith, *Brit. Med. Journ.*, June 14, 1902, p. 1470.

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Thomas H. Halsted, *Trans. Amer. Laryngol. Assoc.*, xxvii., 1905, p. 7.

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HERPES

In herpes an eruption of vesicles, generally unilateral, may occur on the uvula, soft palate, faucial pillars, and occasionally the posterior pharyngeal wall or epiglottis. Sometimes it extends to the arytenoids and ventricular bands. The vesicles vary in size from a pin's head to a split pea. This first stage of vesicle formation rarely comes under observation, so rapidly do the vesicles rupture to form small, white, round, shallow ulcers. These ulcers soon become covered with a thin fibrinous exudation, simulating an aphthous ulcer. The eruption may be coincident with the appearance of herpes on the lips or face, but more commonly it occurs alone. It is generally ushered in with chilliness, fever, acute burning pain, and dysphagia. It occurs in subjects who are in poor general health, especially if overworked or worried (Plate XIV., Fig. 1, facing p. 442).

The treatment is symptomatic—rest in bed and anti-neuralgics until the pain is relieved and the fever falls, and then general and tonic treatment. A few doses of quinine, aspirin, phenacetin, or antipyrin will relieve the sharp pain. If necessary, sprays or lozenges of morphine, cocaine, or carbolic are ordered (Formulæ 5, 6, 31, and 43). A single application of a pencil of nitrate of silver to the freshly formed ulcer has a good effect.

PEMPHIGUS

Pemphigus affecting the mucous membrane of the mouth and larynx is a rare affection. It may occur in either the chronic or the acute form.

Etiology.—Pemphigus is generally secondary to the skin eruption, but occasionally the eruption makes its appearance primarily, and perhaps solely, on the mucous surfaces. The etiology is extremely obscure. Pemphigus is apt to follow on nervous strain or overwork, and is generally regarded as a tropho-neurosis. Neither sex nor age appears to influence the disease, although it is more frequently met with in the elderly and infirm. Microscopic and bacteriological examinations, and blood investigations, have yielded negative results. The disease is not epidemic, and neither clinical nor laboratory observations show it to be contagious.

Symptoms.—A pricking or burning sensation in the throat may be the only complaint in the chronic variety. It is not accompanied

by fever, and patients otherwise feel well. Acute pemphigus of the mucous membrane is accompanied by headache, prostration, malaise, and fever. Dysphagia and hoarseness will be present according to the situation and severity of the eruption.

Examination.—The appearance of the eruption on the mucous membrane is characterized by the formation of a bleb, varying in size from a lentil to a large almond, and filled with a yellowish fluid, similar to that found in the bullous formation on the skin. This bleb finally ruptures, and a milky-white membranous deposit remains. It is possible that when it occurs on mucous membranes the eruption never goes through the bullous stage, or does so very quickly. Within half an hour of the pricking sensation complained of, the bulla characteristic of the complaint may have formed and burst. According to Chiari, the bullæ are the result of a rapid exudation; a slow exudation simply raises and discolours the epithelium, giving the greyish deposit the appearance of a diphtheritic membrane. Anyhow, many cases are met with in which no bleb is ever seen, and the diagnosis has to be made from the appearance of the collapsed membrane. The bullæ, or membranous deposits, may be found anywhere on the mucous membranes of the nose, pharynx, larynx, or mouth. The most frequent sites are on the cheeks, gums, and faucial pillars and epiglottis. A deposit may heal up and leave no trace behind. Others succeed at irregular intervals of days, weeks, months, or years, and the disease may disappear or wear out the patient.

In a case I saw by the kindness of Dr. G. A. Leland, of Boston, almost the entire mucous membranes of the palate, cheeks, lips, and gums had exfoliated in one attack. In a subsequent one the nose was involved. The healing of the bullæ in the nose may lead to adhesions and stenosis, just as pemphigus attacking the eye leaves behind the "essential shrinking of the conjunctiva" of ophthalmologists. In the pharynx it may produce adhesion of the soft palate.*

Diagnosis.—When the affection is secondary to the skin eruption, the diagnosis offers no difficulty. It may be a difficult matter when pemphigus appears primarily on the mucous membrane. It has to be distinguished from herpes, diphtheria, syphilis, tuberculosis, and the effects of caustics.

Progress and prognosis.—An attack may last from two or three to five or fifteen days, but fresh attacks at irregular intervals are common. The prognosis is generally stated to be favourable, especially if the bullæ are limited to mucous surfaces (Montfort and J. Charles). But Semon and others have known of death

* Avellis, *Munch. med. Woch.*, 1900.

from exhaustion in prolonged and relapsing cases,* and I have known pemphigus of the larynx to persist for two years and then end in death.

Treatment.—Local applications have no influence whatever (J. H. Bryan). The constant irritation may be eased by alkaline washes and sedative lozenges.

Arsenic carried to the extreme of tolerance has been beneficial in some cases, and liquor opii sedativus, in increasing doses, has improved the condition for a time.

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EXUDATIVE ERYTHEMA

Under this title T. K. Hamilton describes an extremely rare condition, of which he has seen four cases. All occurred in females over 50 years of age. Two were unmarried, and in all of them the rheumatic or rheumatic-gout diathesis played a prominent part. The symptoms complained of were—irritating cough, some dysphagia, dryness of the mouth and throat (a modified form of the condition known as xerostomia), and a general feeling of malaise. Examination showed that the epiglottis was the point of selection at first, and that from it the conditions spread to the surrounding parts. The free margin of the epiglottis was covered with small, irritable-looking spots of ulceration with slightly thickened edges and somewhat excavated centres, but no induration. None of these spots of exudation ran together to form larger patches, even after several months. From the epiglottis they spread to the ary-epiglottic folds, and thence to the soft palate, tonsillar and buccal regions, and the gums and lips. There was no tendency to invade the larynx below the epiglottis, or the trachea. In two cases xerophthalmia was also present.

The condition differs from herpes and pemphigus by not running a rapid course, and by the absence of constitutional disturbance, while local symptoms are more marked.

Treatment by arsenic, and the local application of ethereal solution of nitrate of silver, is very satisfactory; but one of Hamilton's patients had to take Fowler's solution intermittently for thirteen years.†

* Cresswell Baber, *Proc. Laryngol. Soc.*, London, xli., Dec., 1903, p. 64, and June, 1904, p. 181. (A fatal case.)

† T. K. Hamilton, *Journ. of Laryngol.*, xix., Dec., 1904, p. 617.

CHAPTER LIII
FOREIGN BODIES IN THE AIR- AND FOOD-
PASSAGES.
MEDIAN CERVICAL CYSTS AND FISTULÆ.
MIMICRY OF DISEASE

FOREIGN BODIES

FOREIGN bodies in the nose are attended with less danger, cause less trouble in the neighbourhood, and are less likely to move from one point to another, than those met with lower down. For these reasons they have been considered by themselves at p. 179.

Killian's methods of direct endoscopy (pp. 46 to 52) are so valuable, both in diagnosis and treatment, that they have greatly altered the consideration of this subject in recent years, and have completely revolutionized it in regard to bodies impacted in the bronchi. Still, as neither the instrumentarium nor the technique is universally available, nor is the method always indispensable, full consideration will be given to other measures which can be more easily and promptly carried out.

Cases of foreign bodies in the food- and air-passages are always interesting, for such accidents are not, as a rule, frequent enough in the practice of any one surgeon to enable him to formulate sufficient rules entirely from his own experience.*

The symptoms of a foreign body may be absent, or variable and misleading, or so urgent that life depends directly on the surgeon's promptness and decision.

Catalogue of foreign bodies.—It is impossible to give anything like a complete list of the various substances which may invade the air- and food-passages. The following are those chiefly met with: (1) From the mouth—articles of food, bones of meat or fish, fruit stones, peas, beans, shells, seeds, ears of corn, grasses, pieces of wood or coal, coins, buttons, pencils, marbles, toys, broken pipe-stems, pins, needles, nails, tooth-plates, leeches. (2) From the stomach—vomited food or blood, or the migration of lumbrici or threadworms. (3) From

* Bourdillat, "Observations pour servir à l'Histoire des Corps Étrangers dans les Voies Aériennes," *Gaz. Méd. de Paris*, xxiii., 1868, pp. 94, 121, 135, 180, 212. (Gives references to 300 published cases.)

the lungs—hæmoptysis, hydatids. (4) From the outside—as by penetration of a pin, dart, bullet,* or drainage-tube from the neck.† (5) From surgical measures—detached portions of instruments, sprays, brushes, cotton-wool, gauze, sponges, antrum plugs, intubation tubes, broken-off cannulæ of tracheotomy tubes,‡ amputated tonsils, adenoids or other growths, and hæmorrhage. (6) Arising *in situ*—necrosed cartilage, ulcerating sloughs, membrane, effused blood. (7) Penetration from the neighbourhood—ulceration or extension of malignant disease from the pleura, thyroid gland, or œsophagus, or the penetration of a tubercular gland from the mediastinum.§ (Fig. 291.)

Classification.—Foreign bodies must be considered according to their shape and size. Light or sharp-pointed bodies (fishbones, nutshells, pins, needles, etc.) are apt to be arrested in the pharynx or larynx. Heavier and smoother substances, such as buttons, beads, and coins, generally pass lower.

Etiology.—These accidents are predisposed to by impaired sensation or muscular action, e.g. malignant, tubercular, or other ulceration of the larynx, diphtheria, tracheotomy, bulbar or other central nerve lesions, alcohol, narcotics, unconsciousness (syncope, coma, or general anæsthesia). The insane are apt to swallow strange substances and get them impacted. The passage of foreign bodies from the mouth into the lower air-passages generally occurs when the glottis is taken by surprise, as in the deep inspiration of running or making an effort, or the sudden inhalation which precedes a laugh, or cough, or cry of surprise.

An analysis of recorded cases suggests that the most frequent

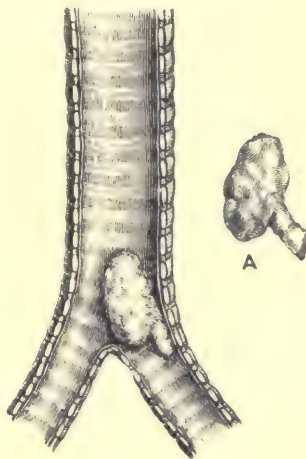


Fig. 291.—Foreign body in the air-passages.

Shows the situation where a caseous bronchial gland penetrated the trachea and blocked the left bronchus. The gland—removed post-mortem—is shown at A with its pedicle. This latter consisted of thickened capsule, and prevented removal of the foreign body, even after tracheotomy. (R. W. Parker's case.)

* Pierce J. Candee, *Amer. Med.*, July 11, 1903.

† C. A. Parker, *Proc. Laryngol. Soc., London*, vi., March, 1899, p. 62.

‡ D. Galatti, *Ann. de Méd. et de Chir. Infantiles*, 5 Année, Dec. 1, 1901, No. 23.

§ Billot, *Ann. des Mal. de l'Oreille*, 1896, No. 3. (Gives records of 19 cases in which the tube became detached from its plate and fell into the lower air-passages. Patients who have to wear a tracheotomy tube permanently should renew the cannula when it shows signs of wear.)

§ Voelcker, *Path. Soc. Trans.*, 1898, p. 22.

sites in the air-passages in which foreign bodies are arrested are the larynx and the right bronchus.*

Prognosis.—This depends on so many factors that each case must be judged by itself. A foreign body has remained in the air-passages for sixty years before being expectorated.† Yet no patient can be considered out of danger with a foreign body lodged anywhere in the food- or air-passages. In the case of bodies in the bronchi, and left to themselves, the mortality used to be 58 per cent. ; when treated, chiefly by tracheotomy, it fell to 30 per cent. Nowadays, thanks to Killian's direct methods, the death-rate is practically nil in all cases treated early, and under any circumstances averages only 8 to 9 per cent. (Killian).

Death may occur suddenly from suffocation, or slowly from the inflammation induced. In the case of ascarides in the trachea, death may result from convulsions.‡ The danger varies with many circumstances—the lapse of time, the ineffectual attempts made at removal, the age of the patient, and the nature of the foreign body. Thus, beans and similar seeds are the most dangerous, owing to their tendency to swell, and to break in pieces when seized.

History of accident.—In the case of children, or of adults in whom the accident occurs during sleep, syncope, intoxication, or unconsciousness, the history may be wanting. On the other hand, patients will sometimes give the most graphic description of their sensations when, for instance, a tooth-plate slipped down the throat, yet investigation will show it reposing on their toilette table! Still, when a patient with a markedly one-sided affection of the chest tells a story of alarming choking over a small substance which was successfully "swallowed," or even insists that it is still in the chest, and is the cause of the ailment, his statements should not be disregarded, as they too frequently are.

In children the symptoms caused by a foreign body may be mistaken for those of laryngismus, laryngitis, diphtheria, or tonsillitis. And, on the other hand, any of these disorders may sometimes, when of sudden onset, arouse the suspicion that the child has swallowed something "the wrong way."

When a foreign body gets into the air-passages of a person who is eating while in a state of intoxication, the symptoms are liable to be mistaken for those of an apoplectic seizure.

Symptoms.—The symptoms may be grouped into three stages :

* Prof. Gross, "Treatise on Foreign Bodies in the Air Passages." Philadelphia, 1854.

† Gross, quoted by Morell Mackenzie, "Diseases of the Throat and Nose," vol. i., p. 568. London, 1880.

‡ Carlo Raimondi, *La Riforma Medica*, Anno xiv., 1898, No. 11, p. 123.

(1) those of obstruction following the introduction of a foreign body, or recurring when it shifts its position; (2) irritation, produced by its presence and varying with its character; and (3) inflammation coming on at a later and variable period.

The immediate symptoms of obstruction are generally sufficiently obvious, particularly when the pharynx or the larynx is concerned. But it is important to remember that the painful sensations left by a sharp substance in the pharynx frequently persist for some time after the foreign body has been either voided or successfully swallowed. In fact, it is curious that foreign bodies complained of in the pharynx are, in the majority of cases, imaginary, whereas many of those actually present in the bronchi have never even been suspected.

The patient with this persistence of painful sensation in the pharynx should be reassured by a thorough investigation, and then treated with bromides, and a carbolic acid lozenge (Formula 43), or a slightly anæsthetic spray (Formula 31).

Although pain, irritation, and useless "hemming" are the usual symptoms in pharyngeal cases, it must not be forgotten that a bolus of food or a tooth-plate may get impacted suddenly over the glottis, and that sudden loss of consciousness may then be the first symptom.

In the *pharynx* a foreign body may produce acute pharyngitis, septic pharyngitis, and abscess, or severe hæmorrhage.

In the *naso-pharynx* foreign bodies may arrive by vomiting, or may travel there from the lower air-passages when a patient is inverted.*

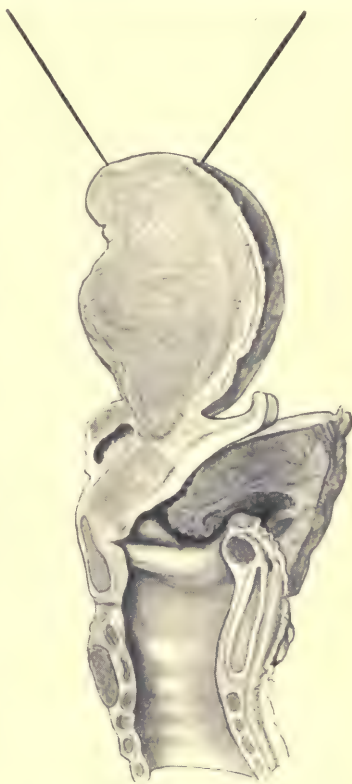


Fig. 292.—Foreign body in the larynx.

The aditus laryngis is completely obstructed by a piece of meat, which is firmly locked between the epiglottis and the posterior and outer walls of the larynx. (*Trans. Laryngol. Soc.*, London, vol. iii., 1895-96, p. 74. *St. Bartholomew's Hosp. Mus.*, No. 1660a.)

* D. R. Paterson, *Proc. Laryngol. Soc.*, London, vi., March, 1899, p. 61.

In the *larynx* a foreign body generally produces immediate and alarming symptoms of dyspnœa, aphonia, irritation, cough, and suffocation. If a large substance, such as a bone or a bolus of food, gets jammed in the laryngo-pharynx, or a smaller body becomes wedged between the cords, death is almost instantaneous. (Fig. 292.) If the substance passes the cords and enters the trachea, the dyspnœa is succeeded by a false calm. Smaller bodies, which do not impede respiration, may only cause an irritable

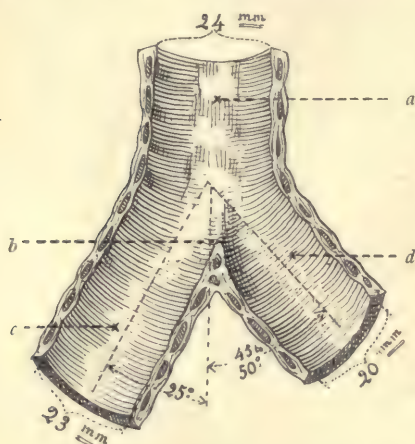


Fig. 293. — Semi - diagrammatic drawing of a vertical, transverse section of the bifurcation of the trachea, viewed from the front.

It will be noticed that the right bronchus is nearly as wide (23 mm.) as the trachea (24 mm.), with which it is in a more direct line than with the left. Hence foreign bodies are more apt to enter the right bronchus, into which they are also directed by the interbronchial ridge which is slightly to the left of the middle line. *a*, Trachea; *b*, interbronchial ridge; *c*, right bronchus; *d*, left bronchus.

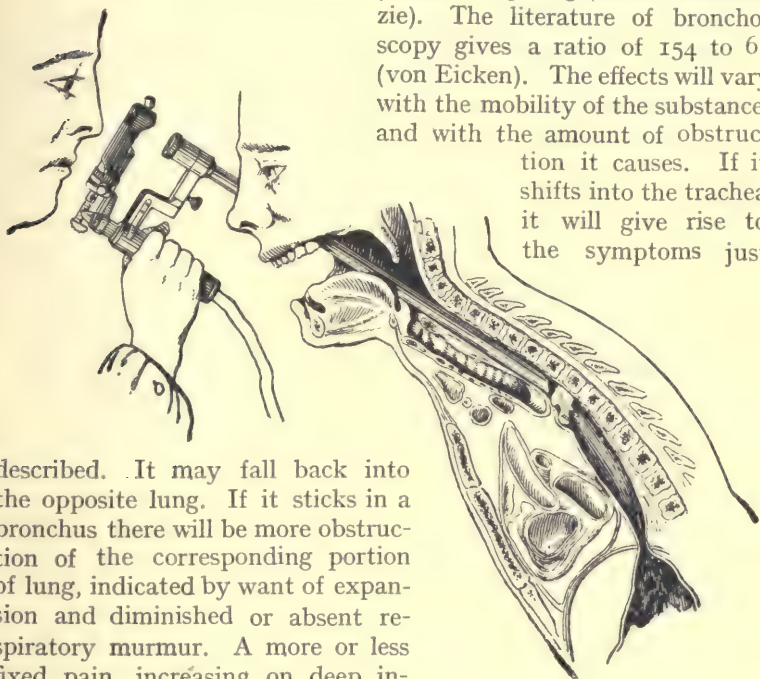
cough, with some alteration in voice, some dyspnœa and slight pain. The causes of dyspnœa may be (1) mechanical obstruction to the passage of air, or (2) laryngeal spasm set up by irritation. The former is of course persistent, and the latter transient. The mechanical obstruction will vary with the size and character of the substance, and may only develop as inflammation sets in. Spasm recurs whenever the body shifts its position and approaches the cords. In the larynx a foreign body is also apt to lodge in the pyriform sinuses, or be caught on the ventricular bands, above the glottis. It may lead to inflammation, perichondritis, ankylosis of the crico - arytenoid joint, and glottic stenosis; or it may escape into the trachea or down the gullet.

In the *trachea* a foreign body seldom remains long in one place, unless it gets fixed across the bifurcation.* It may give no indication of its presence, or only cause occasional paroxysmal cough, with an unaltered voice. But, often unexpectedly, a violent attack of alarming dyspnœa may occur whenever the foreign substance is coughed up into the larynx. Any of these attacks may prove fatal if the foreign body is not expelled, or may quickly and completely subside as the substance falls back into the trachea.

* A. Coolidge, jun., *Trans. Amer. Laryngol. Assoc.*, 28th Congress, 1906, p. 302.

Of the two *bronchi* a foreign body is more likely to enter the right, which is the larger, and in more direct line with the trachea. It is also guided into the right bronchus by the projection of the interbronchial septum to the left side (Fig. 293). Statistics show that the right bronchus is invaded oftener than the left in the pro-

portion of 5 to 3 (Morell Mackenzie). The literature of bronchoscopy gives a ratio of 154 to 61 (von Eicken). The effects will vary with the mobility of the substance, and with the amount of obstruction it causes. If it shifts into the trachea it will give rise to the symptoms just



described. It may fall back into the opposite lung. If it sticks in a bronchus there will be more obstruction of the corresponding portion of lung, indicated by want of expansion and diminished or absent respiratory murmur. A more or less fixed pain, increasing on deep inspiration, may be the only complaint. In some cases a certain tolerance is set up, and recovery has taken place after a foreign body has been lodged in the chest for nine or more years, during which it caused no trouble beyond "winter cough."* The two parts of the respiratory passages in which foreign bodies may reside for a considerable time without exciting alarm, or, indeed, attracting much notice, are the nostrils and the bronchi. But sooner or later mischief is sure to start. Unilateral chest disease in a child, with signs of cavity and purulent expectoration, is frequently caused by the presence of a foreign body (Godlee

Fig. 294.
Direct œsophagoscopy.

Removal of the broken half of a vulcanite denture from the œsophagus, at the level of the bifurcation of the trachea (i.e. 10 in. from upper molar teeth). It had been impacted here for two and a half years.†

* J. L. Bunch and R. Lake, *Lancet*, Sept. 25, 1897.

† StClair Thomson, *ibid.*, Jan. 4, 1913, p. 16.

and Hector Cameron). Tuberculosis, dilatation and ulceration of the bronchi, bronchiectasis, consolidation and gangrene of the lung, pleurisy or abscess, and death are the usual consequences.

In the *œsophagus* the chief symptoms are pain and obstruction to the passage of food. The mucous membrane of the gullet is sometimes very tolerant; thus, I have removed by *œsophagoscopy* a tooth-plate which had been fixed in it for two and a half years (Figs. 294–297), and Guisez, by the same method, has extracted a coin after four years. Indeed, in many cases, fatal complications seem to have been due to blind efforts at extraction, or to external *œsophagotomy*—always a serious operation.* But if the foreign body remains impacted it leads, sooner or later, to ulceration, septic cellulitis, and perforation. A pin, bone, or coin in the gullet may cause death by perforating the aorta or one of the large blood-vessels.†

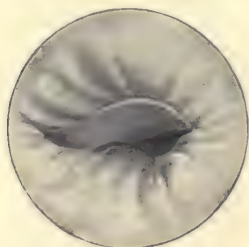


Fig. 295.—Edge of vulcanite denture, impacted in the gullet, as seen through the *œsophagoscope*.



Fig. 296.—Broken half of small vulcanite denture, removed from gullet by *œsophagoscopy*. *Life size*.

In most cases it is arrested behind the cricoid cartilage. Once arrived in the stomach, any substance is generally able to pass through the rest of the alimentary tract without doing mischief.

Examination.—When the urgency of the symptoms does not prevent it, a careful examination, under good illumination, aided by a spray of cocaine, should always be made before attempting removal. In nearly all cases it is advisable to have a tracheotomy outfit ready to hand, in case any movement on the part of the substance should start laryngeal spasm. Examination must be carried out systematically, as the patient's own sensations are not always to be trusted. Thus he may refer them to the larynx, when the postnasal space is really the area invaded.‡ Particular attention

* J. Guisez, "Maladies de l'Œsophage," p. 270. Paris, 1911.

† Walter Rivington, *Med.-Chir. Trans.*, lxi., 1886, p. 63.

Isambard Owen, *Brit. Med. Journ.*, June 27, 1903, p. 1490.

J. Lovett, *ibid.*, May 1, 1909, p. 1064.

‡ Schadowaldt, *Deut. med. Woch.*, 1887, Nos. 32–33.

F. Semon, *Proc. Laryngol. Soc., London*, iii., April, 1896, p. 80.

should be given to the region around the base of the tongue, the tonsils, pharyngeal wall, the valleculæ, the sinus pyriformis, and the postnasal space. Fish-bones, pins and needles are frequently embedded in this neighbourhood, and, owing to the strings of thick mucus which obscure the field, their location can sometimes be better determined by digital examination or a probe. The laryngopharynx can be inspected by hypopharyngoscopy (p. 46). In children, Killian's direct method is required for the larynx, and is generally obligatory in all cases where the foreign body has passed below the glottis or into the œsophagus.

The Röntgen rays are invaluable in the case of metallic substances, not only for diagnosis, but also for guiding treatment.

Treatment.—No precise rules of treatment can be laid down, but certain principles should be kept in mind. Thus, the administration of vomitants is dangerous; blind efforts at pushing down or dragging out a foreign body are risky, and should never be attempted until it has been determined that it has no sharp corners or claws; inversion and succussion, except in great emergency, should not be tried unless the instruments for a rapid tracheotomy are at hand.

The means adopted will depend on (1) the size and nature of the foreign body, (2) its situation, (3) impaction and mobility, and (4) the symptoms. As regards the latter factor, cases may be considered according as they are (a) urgent, or (b) not acute.

(a) *If suffocation is threatening*, and the intruding substance cannot be seen or hooked up with the forefinger, the practitioner should be prepared to do a laryngotomy (p. 773) or a tracheotomy (p. 775) with any improvised instruments—a penknife as a scalpel, a goose-quill, or piece of drainage-tube, or the metal case of a clinical

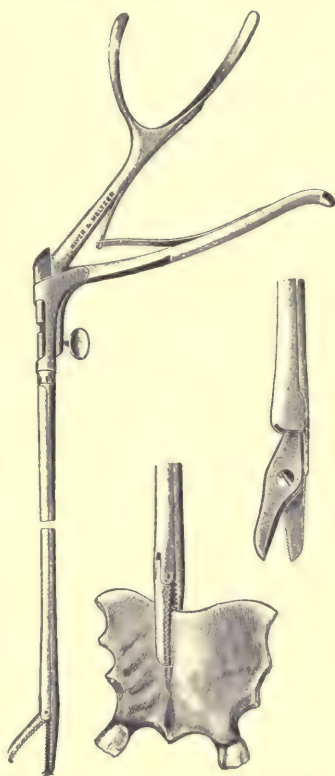


Fig. 297.—Irwin Moore's non-slipping forceps for grasping and for cutting foreign bodies in the air- and food-passages.

thermometer opened at both ends, as a cannula, and two hair-pins bent to act as retractors. The patient may then be inverted (face downwards) and smartly smacked on the back. If this proves useless, an improvised opening is made through the trachea or the crico-thyroid membrane. If this does not give relief, showing that the foreign body is below the level of the cannula, inversion may again be tried.

No patient with a foreign body below the level of the vocal cords should ever be left beyond reach, unless a tracheotomy has been performed. This should be done as low as possible.

(b) *When the symptoms are not acute*, more deliberate steps can be carried out, but a foreign body should never be left longer than possible.*

Methods of removal.—I. From the *pharynx*, or the *larynx* above the cords, the substance can be removed with the laryngoscope, cocaine, and suitable forceps. A leech in any position in the air-passages is speedily paralysed if painted with a 10–20 per cent. solution of cocaine. If the patient is placed prone, with the head hanging down, the leech is soon coughed out.†

2. When the object is impacted in the *larynx* it may be necessary to perform tracheotomy before removal through the mouth is attempted. If this fails, thyrotomy may be required (p. 788). To guard against inflammatory reaction, the cannula should be worn for a few days.

3. When the substance is in the *trachea* or *bronchi*, those who possess Killian's instruments, and the necessary skill, may proceed at once to upper direct endoscopy (p. 46).‡ In the case of beans and peas (cf. p. 182), tracheotomy should always be performed before the examination is attempted, and lower bronchoscopy should be resorted to at once unless the case is brought for treatment within a couple of hours of aspiration.§

In 1907 Killian collected the records of 164 cases in which a foreign body had been removed from a bronchus by the direct method, and the patient saved from almost certain death.|| This is the method of choice which should be employed not only universally, but as promptly as possible. The lapse of thirty-six hours may suffice for the development of a double and fatal pneumonia.¶

* J. Guisez, "Diagnostic et Traitement des Corps Étrangers des Voies Aériennes," *Ann. des Mal. de l'Oreille*, xxxix., 1913, No. 6, p. 554.

† Masterman, *Lancet*, Aug. 22, 1908 (from *Parasitology*, June, 1908).

‡ StClair Thomson, "Removal through the Mouth of a Shawl-Pin impacted in a Secondary Bronchus," *ibid.*, May 7, 1910.

§ G. Killian, *Journ. of Laryngol.*, xxix., June, 1914, p. 325.

|| *Ann. of Otol., Rhinol., and Laryngol.*, xvi., June, 1907, No. 2, p. 251; and *Zeitschr. f. Ohrenheilk.*, Bd. lv.

¶ Von Eicken, *Deut. med. Woch.*, xxxiv., April 23, 1908, S. 728.

When the direct method is not available, tracheotomy should be done in all cases. A carefully compiled summary of 554 cases furnishes a strong argument in favour of operative measures—chiefly that of tracheotomy. From this it appears that when no operation was performed, death resulted in 42·5 per cent., and recovery in about 57·5 per cent. On the other hand, in the cases in which operative measures were resorted to, death resulted in about 24·8 per cent., and recovery in 75·2 per cent. In 167 cases in which tracheotomy was performed, 130 recovered, and 37 died.* The edges of the tracheotomy wound are held apart, and the stimulus of the first full breath often produces a cough which will expel the substance. If the operation has been done under cocaine in an adult, he is able to assist in this voluntarily. Otherwise the mucous membrane may be irritated with a probe. Failing this, the trachea is painted with cocaine and the substance carefully searched for, with the guidance, in some cases, of the X-ray screen.

When a tracheotomy has been performed, it is permissible to postpone further measures; for it is well known that this operation diminishes the sensibility of the larynx, and there is no longer the danger of sudden and fatal laryngeal spasm should the foreign body shift its position and become engaged in the glottis. This same diminution of the naturally extreme sensitiveness and alertness of muscular spasm in the larynx will also increase the chance of the body being safely coughed up and expelled through the larynx.†

If the foreign body is still retained in the trachea, if its situation has not been definitely located, and in all cases where it is fixed in a bronchus, then only method of detecting and removing it is by Killian's direct bronchoscopy (Fig. 298).

Such surgical measures as transmediastinal bronchotomy need only be mentioned to be emphatically condemned.

4. *In the œsophagus.*—When a foreign body has passed the entrance to the glottis there is no need for hasty action, such as ill-considered efforts at pushing it downwards or fishing it upwards. Tempestuous attempts at extraction have been responsible for many fatalities, and Chevalier Jackson finds that the mortality list from œsophageal trauma is "truly appalling."‡ Besides, there is seldom any desperate hurry in gullet cases. A smooth, unirritating body like a halfpenny may remain in the œsophagus for eight years without causing symptoms,§ and tooth-plates

* A. E. Durham, *Holmes's System of Surgery*, vol. ii., 1870, p. 487.

† Hector Cameron, *Internal Clinics*, vol. iii., 2nd series.

‡ *Trans. Amer. Laryngol. Assoc.*, xxxiii., 1911, p. 137.

§ W. G. Porter, *Journ. of Laryngol.*, xxix., Feb., 1914, p. 97.

Actual size of Shawl-Pin
17/16 inch.

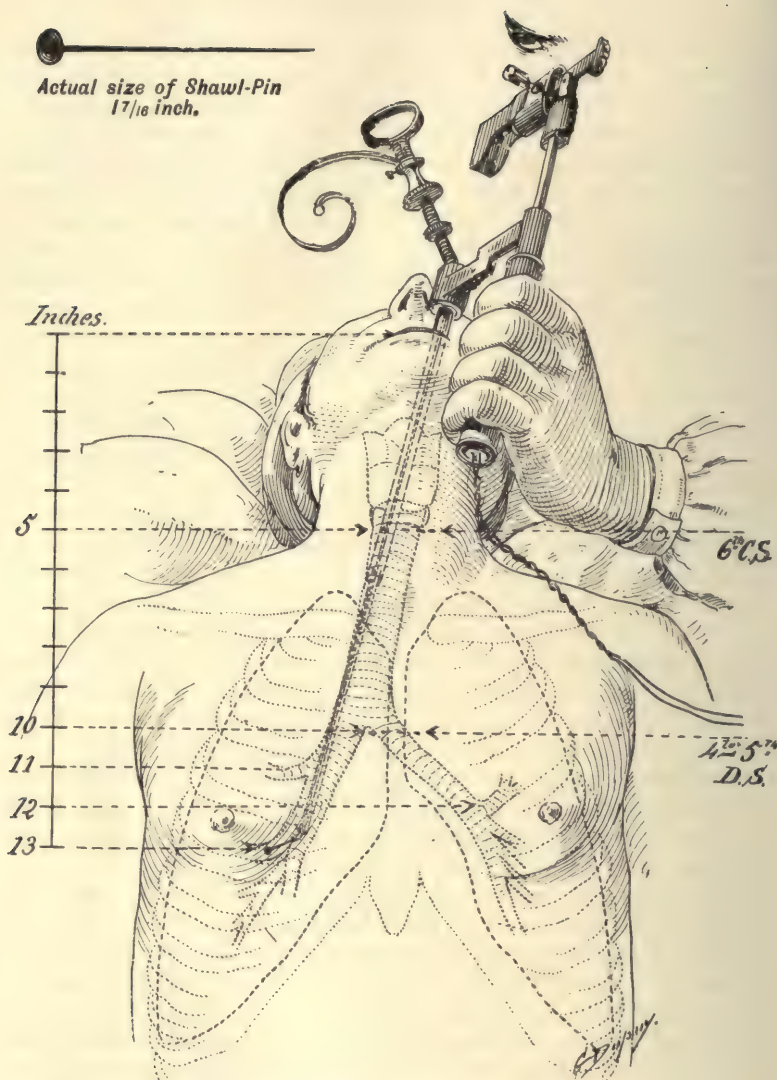


Fig 298.—Direct bronchoscopy.

Removal of a shawl-pin impacted in a secondary bronchus (dorsal) of the right middle lobe. On the right-hand side of this semi-diagrammatic drawing there is indicated the correspondence of the cricoid cartilage to the 6th cervical spine, and of the bifurcation of the trachea to the interval between the 4th and 5th dorsal spinous processes. On the left-hand side of the drawing the distance is given (in inches) from the upper molar teeth to the cricoid cartilage, the bifurcation of the trachea, the branch of the right bronchus to the upper lobe (eparterial branch), the first branch of the left bronchus, and the branch of the right bronchus to the middle lobe. It will be noticed that the length of the trachea is 5 inches, and that the cricoid cartilage is the same distance from the upper molar teeth. It is also seen that the first branch of the right bronchus is given off at a distance of 1 inch from the bifurcation of the trachea, while the left bronchus is 2 inches long before any division takes place.

have lodged in the gullet for two and a half * and even eighteen years.† The majority of substances are arrested behind the cricoid plate, or just as the œsophagus enters the chest (Fig. 299).

A radiogram, and careful use of a bougie, will help in determining the size, shape, and situation of the obstruction; but, in all cases, Killian's direct œsophagoscopy is the method of preference

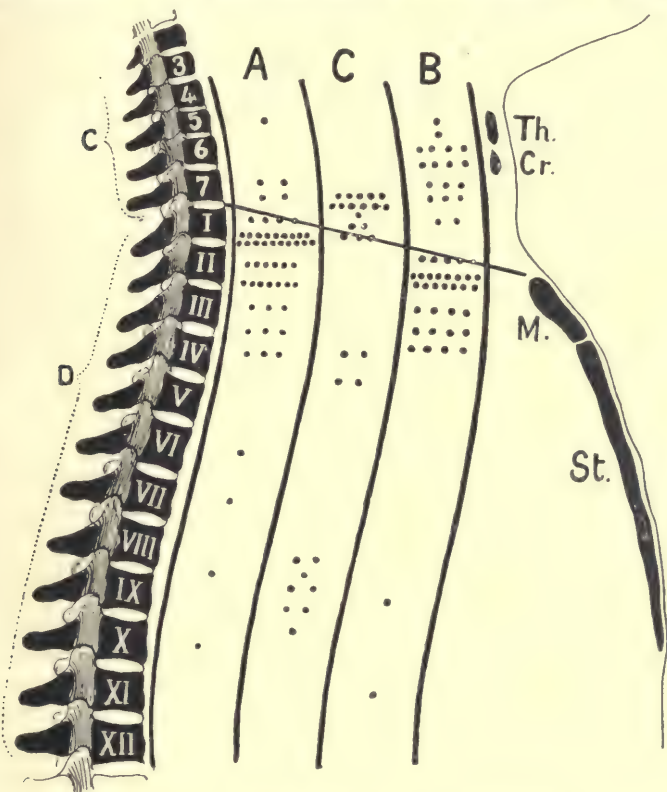


Fig. 299.—Foreign bodies in the œsophagus.

A schematic drawing modified from H. Burger. It shows the site of arrest in 135 cases. Column A indicates the situation of the foreign body when this was given in relation to the spine. In column B are indicated those cases where the position was described by relation to the thyroid, cricoid, manubrium, or sternum. Column C embraces those bodies where the location was more generally stated. From this diagrammatic drawing it is at once seen that the large majority of foreign bodies in the gullet are arrested in the cervical position, either behind the cricoid cartilage or just as the tube enters the thorax.

both for diagnosis and treatment. It is a much simpler and less alarming procedure than is bronchoscopy. The exceptions to its

* StClair Thomson, *Lancet*, Jan. 4, 1913, p. 16.

† Braden Kyle and Chevalier Jackson, *Trans. Amer. Laryngol. Assoc.*, xxxv., 1913, p. 241; and *Journ. of Laryngol.*, xxix., July, 1914, p. 377.

use are given by Killian as follows: If it is seen that the wall of the œsophagus has been deeply injured, an early œsophagotomy is required. If the foreign body is large, has sharp edges or hooks (e.g. dental plates), all attempts at extraction are dangerous. In such cases, if the foreign body is situated no deeper than twenty-four to twenty-six cm. (10 in.) from the upper incisors, œsophagotomy is indicated; if deeper, then gastrotomy or posterior mediastinotomy is called for.* Chevalier Jackson, on the other hand, holds that external surgery has no place in treatment unless the foreign body has escaped through the œsophageal wall. In all other cases, no matter how large the body, if it has gone in by the natural passage, it can be brought out by the same route.† Even when confronted with such a dangerous implement as an open safety-pin, with the point upwards, it is possible, through the œsophagoscope, to close the pin with a special instrument, or else to turn it round before extraction.‡ Others, finding the œsophagus on the stretch if not already perforated, prefer, under guidance of the eye, to manipulate the safety-pin into the stomach, turn it round there, and then bring it up through the tube, spring-end first.§

In the case of flat substances, like coins, lodged behind the cricoid cartilage, the metal barrel of the œsophagoscope is apt to slip past them. In such cases Moure highly recommends the coin-catcher or crochet of Kirmisson, as safe and effective. He as strongly condemns the basket (*panier*) of Graefe.||

If the Killian method is not available the following suggestions might be followed: If a piece of meat is tightly impacted in the gullet it is safer to wait twenty-four hours to allow of disintegration. Fish-bones and other small bodies may be removed by the umbrella probang (Fig. 300). Coins may be carefully raised in a coin-catcher (Fig. 301), or seized with forceps guided by the Röntgen screen. If extraction is impossible, and if the foreign body is undoubtedly some soft round body, it may be pushed on into the stomach with an œsophageal bougie,

5. Once arrived in the *stomach*, the foreign body should be enveloped by the administration of such foods as porridge and mashed potatoes. No purgatives are given for some days. In the case of metallic substances the progress into the intestines can be watched on the Röntgen screen. In cases where the screen

* G. Killian, *Brit. Med. Journ.*, Aug. 30, 1902, p. 569.

† Chevalier Jackson, *Laryngoscope*, xix., 1909, No. 10, p. 743.

‡ Thomas Hubbard, *Trans. Amer. Laryngol. Assoc.*, xxxiii., 1911, p. 128.

§ Chevalier Jackson, *ibid.*, p. 138.

|| *Rev. Hebd. de Laryngol.*, vol. xxx., Sept. 4, 1909, No. 36.

shows that the substance has not been able to pass out of the stomach, it may be extracted through the œsophagoscope.* If the attempt is not successful, a small electro-magnet can be passed



Fig. 300.—Umbrella probang.

down a celluloid stomach-tube, and, guided by the Röntgen screen, be brought into contact with any small metallic body.† Failing these measures, such cases would require a gastrotomy.



Fig. 301.—Coin-catcher of Howard Marsh.

The use of the electro-magnet in this department of laryngology has been studied by Garel,‡ De Roaldes,§ and Macintyre.||

MEDIAN CERVICAL CYSTS AND FISTULÆ

Cystic dilatation of the thyro-glossal duct, and the fistula resulting when this ruptures or is opened by the surgeon, are described in works on general surgery; but as such cases frequently come to a laryngologist they may be briefly referred to.

Pathology.—The thyro-glossal duct is an obsolete embryonic canal extending from the foramen cæcum at the base of the tongue downwards behind the hyoid bone, to terminate underneath the deep fascia in the front of the neck in the neighbourhood of the thyroid isthmus (Fig. 302). In the ordinary course of development this duct disappears. But accessory thyroid growths may develop from any part of its tract; the laryngologist chiefly encounters them at the base of the tongue (p. 423). If the upper part of the duct remains unobliterated a dermoid cyst may form in the substance of the tongue, or it may be present in the pharynx, and may even be so pedunculated that the patient is able to protrude part of it from the mouth (p. 451). If the lower part of the duct preserves its patency, a cyst, containing mucoid or glairy fluid, forms in the middle line; and if this ruptures spontaneously, or is opened, a median cervical fistula is formed. The duct is lined with ciliated epithelium.¶

* Chevalier Jackson, "Tracheo-Bronchoscopy and Gastroscopy." St. Louis, U.S.A.

† Stephen Mayou, *Lancet*, Dec. 6, 1902, p. 1902.

‡ *Ann. des Mal. de l'Oreille*, Fév., 1901.

§ *Rev. Hebdomadaire de Laryngol.*, Jan. 4, 1902.

|| *Brit. Med. Journ.*, ii., Aug. 30, 1902, p. 572.

¶ Wyatt Wingrave, *Proc. Laryngol. Soc., London*, v., Nov., 1897, p. 10.

Examination.—The cyst always precedes the formation of the fistula. Both are therefore met with in or near the middle line of the neck, anywhere between the hyoid bone and the top of the sternum, but generally a little below the level of the cricoid cartilage (Fig. 303). They are never present at birth; but may occur soon afterwards, or as late as the fourteenth year.

Progress.—The cyst is apt to become irritated and inflamed by pressure of the collar or from the use of iodine. It may

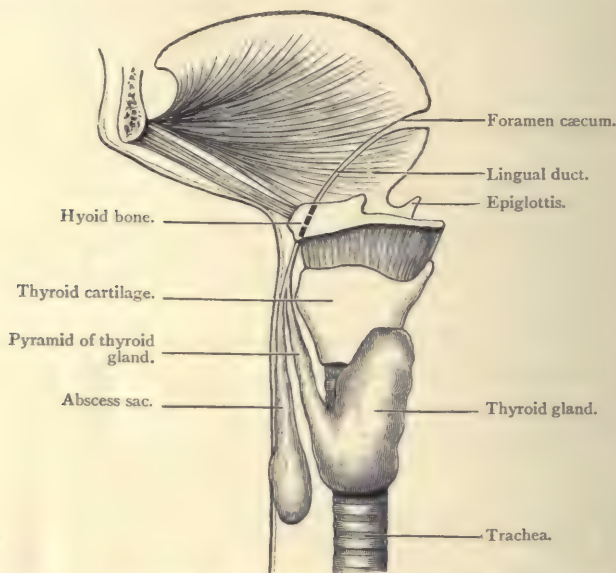


Fig. 302.—Diagram to show the relation of parts in a case of median cervical fistula. (After C. F. Marshall.)

thus rupture, or it may be incised by the surgeon. The result, in either case, is unfortunate, as this leaves a sinus which seldom closes. It oozes a clear glairy fluid; the secretion sometimes ceases for varying periods of time.

Prognosis.—Unless the patient urgently requests the removal of the cyst for æsthetic reasons, it should be left alone and carefully protected from irritation. He can be assured that it is quite harmless. In the case of a fistula, the patient should be advised that operative treatment is more extensive than he is apt to expect, that it may have to be repeated, and is sometimes disappointing.*

Treatment.—A cervical fistula is frequently treated by injecting

* R. S. Charsley, *Proc. Laryngol. Soc., London*, iv., April, 1897, p. 85.

along it solutions of iodine, nitrate of silver, or other astringents. In the majority of cases this does no more than produce a temporary cessation of the flow.

A fistula—or a cyst when it calls for treatment—must be carefully dissected out in its entire course. Failure in obtaining a perfect



Fig. 303.—Thyro-glossal cyst.

In this case it is in the right side of the neck, but generally it occurs in the middle line.

cure is generally due to the difficulty of following the duct behind the hyoid bone. This difficulty is met by dividing the hyoid bone in the middle line, as suggested by Herbert E. Durham.*

* *Trans. Roy. Med.-Chir. Soc.*, 1894.

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 Robert C. Myles, *Laryngoscope*, xiv., 1904, No. 5, p. 396.
 W. G. Spencer, "The Thyroglossal Tract," *Lancet*, Feb. 21, 1914, p. 522

MIMICRY OF DISEASE; MALINGERING

Hysterical affections have been incidentally referred to under the various disorders where they are likely to occur. The patient whose suffering physiognomy is well shown in Fig. 304 so well imitated the subjective symptoms of frontal sinusitis, although she had only a trifling unilateral nasal catarrh, that I was induced,



Fig. 304.—Expression in imitated frontal sinusitis.

under protest, to make an exploratory opening into her left sinus. It was absolutely healthy and was at once closed up. All her symptoms promptly disappeared. Another patient excited sympathy by introducing maggots into her nostrils, even allowing them to crawl down her pharynx. Both these patients were habitual frequenters of the various out-patient departments in King's College Hospital.

Functional aphonia and dysphagia have been described on pp. 550 and 597. The symptoms of paresis of the palate may be imitated (p. 461). Recurrent membranous pharyngitis, spread over a period of nineteen years, and affecting only the *left* side,

was found by Middlemass Hunt to be artificially produced, probably by liquor epispasticus.* In an analogous case, recorded by Semon, the pharyngeal ulceration was probably brought about by nitric acid.†

Conscripts have been known to escape duty by producing artificial membranous sore throats, resembling diphtheria, by rubbing in powdered cantharides with the finger. An hysterical patient of Chevalier Jackson, to excite interest, acquired the knack of aspirating tin-tacks into her bronchi.‡

The most astonishing case of malingering is probably that of Lack's, where a man successfully enacted the symptoms of laryngeal stridor and allowed a tracheotomy to be performed in order that he might enjoy the rest of a comfortable hospital bed.§

* *Journ. of Laryngol.*, Feb., 1898.

† *Trans. Clin. Soc.*, xxviii., 1895, p. 108.

‡ *Laryngoscope*, xix., 1909, No. 12, p. 936.

§ *Clin. Journ.*, Feb. 5, 1896, p. 227.

PART XI.—SOME OPERATIONS

CHAPTER LIV

ROUGE'S OPERATION

(SUBLABIAL RHINOTOMY)

Indications.—This operation may be required for large syphilitic sequestra, osteomata, or malignant growths.

Operation.—A tethered sponge is introduced through the mouth into the postnasal space. Chloroform is administered, and the tongue drawn forward with a clip (Fig. 206, p. 394). The



Fig. 305.—Rouge's operation : First stage.

The upper lip is everted and retracted by an assistant standing behind the patient's head. The dotted line indicates the line of incision. (*From the author's article in Burghard's "System of Operative Surgery."*)

upper lip is everted by an assistant, and an incision is made across the upper gum, a little below the gingivo-labial fold (Fig. 305). The soft parts are easily turned up with a raspatory, bringing the nasal cavities well into view (Fig. 306). Hæmorrhage gives little trouble.



Fig. 306.—Rouge's operation: Second stage.

The soft parts are retracted. (*From the author's article in Burghard's "System of Operative Surgery."*)

When the diseased conditions met with have been treated, the everted lip is turned back into place and secured by a few catgut sutures.

LATERAL RHINOTOMY, OR MOURE'S OPERATION

This method of gaining direct access to the nasal cavities and naso-pharynx has been recommended by Michaux, in 1853, and by other surgeons, and is fully described by Moure of Bordeaux.*

Indications.—This operation is suitable for malignant growths in the roof and deeper regions of the nose, particularly those

* Moure, *Rev. Hebd. de Laryngol.*, Oct. 4, 1902.
Duverger, *ibid.*, Sept. 2, 1905.

originating in the ethmoidal region, the naso-pharynx and the sphenoid. It may also be required in naso-pharyngeal fibromata or syphilitic sequestra.

Operation.—The interior of the nose is prepared with cocaine and adrenalin; chloroform is administered; and the naso-pharynx is packed with sponges (p. 85), or the larynx plugged after a preliminary laryngotomy (p. 773). Two incisions are started from the inner extremity of the eyebrow, one descending to the nasal orifice and the other curving outwards below the orbit (Fig. 307).



Fig. 307.—Incisions for lateral rhinotomy (Moure's operation).

(From the author's article in Burghard's "System of Operative Surgery.")

The bone is exposed and divided (Fig. 308), and a large opening is thus obtained, through which the conditions met with can be freely treated (Fig. 309). The skin incisions are carefully brought together with silkworm gut, and, as healing takes place by first intention, there is practically no disfigurement. (Cf. Fig. 110, p. 222.)

THE NASAL ROUTE TO PITUITARY TUMOURS

In the efforts of surgery to reach the pituitary body the approach was formerly attempted directly through the temporal or frontal areas of the skull. Other routes were designed by way of a lateral rhinotomy, as described and illustrated on p. 761, or by making various osteoplastic flaps which turned the external nose upwards,

downwards, or to one side, in order to reach the sphenoidal sinus and, through it, the sella turcica. These were steps forwards, but a

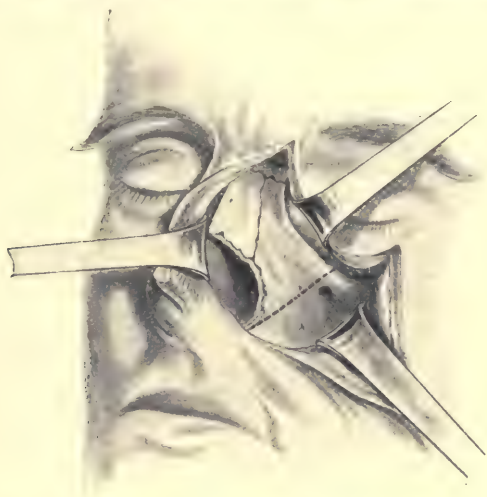


Fig. 308.—The area of bone removed in lateral rhinotomy.

The flaps have been retracted, and the dotted lines show where the bones are chiselled through.
(From the author's article in Burghard's "System of Operative Surgery.")

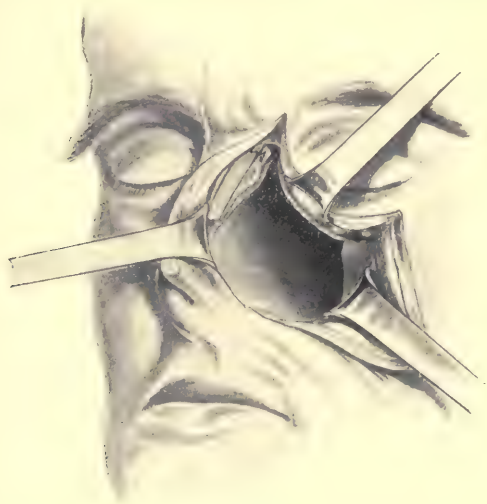


Fig. 309.—Lateral rhinotomy.

The side of the nose has been removed, and direct access obtained to the upper and deeper nasal regions. (From the author's article in Burghard's "System of Operative Surgery.")

mortality of about 30 per cent., and the difficulties of a disfiguring and mutilating operation, made it desirable to evolve a better method.

It is due to the recent progress of rhinology, particularly to the perfection of submucous resection of the septum and to our increased familiarity with sphenoidal surgery, that the nasal route has been made available by the work of laryngologists.

Indications.—These are best left for consideration in works on general medicine and neurology. The operation is sometimes indicated in patients suffering from the symptoms of disease of the pituitary body. Excision of tumours of this area is seldom practicable, but relief by decompression, from the opening and draining of cysts, may

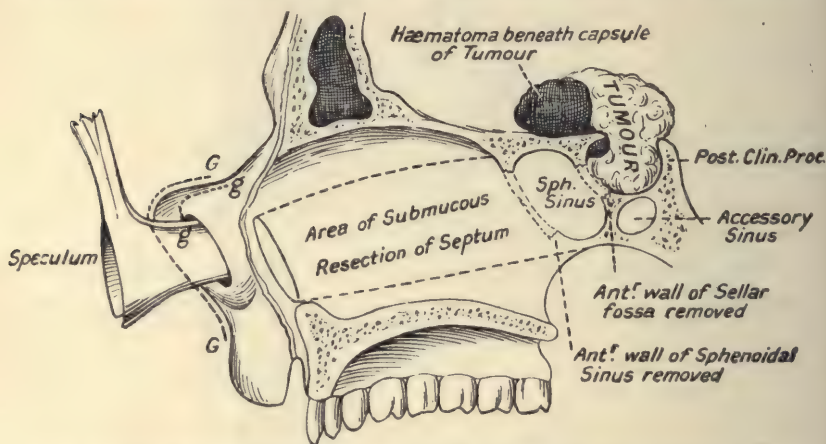


Fig. 310.—Semi-diagrammatic illustration of the nasal route to the pituitary body. (W. Hill.)

be called for. It is well to remember that the results of operation on brain tumours are not, on the whole, very brilliant.*

Operation.—The operation should be prepared for by a careful investigation by neurologist, rhinologist, ophthalmologist, and radiographer. It can be performed under local or general anæsthesia, and in one or more sittings. In the latter case the first sitting may be carried out under cocaine and the final one under chloroform.

A reference to Fig. 310 will show that a free submucous resection of the septum is carried right back to the junction of the vomer and the sphenoid. The bony septum in this line is completely cleared away, so that the rostrum and front wall of both sphenoidal sinuses is laid bare between the two flaps of septal muco-perichondrium. This wall is broken away, as well as the septum which divides one sphenoidal sinus from the other. The next, and the most anxious, step is opening the posterior wall of the sinus so as to strike the sella turcica. By chiselling carefully in the middle line there should be no danger

* Howard Tooth, *Proc. Roy. Soc. Med., Neurol. Section*, vi., 1913, pp. 1-68.

of wounding the cavernous sinuses and carotid arteries. (Plate XI., facing p. 302; Fig. 162, p. 300; and Plate II., facing p. 54.) It is more difficult to make sure of not breaking through the sphenoidal wall too high up, with the risk of wounding the optic chiasma as well as the circular sinus. This false step may be avoided by placing a small piece of a lead plate at the point where it is believed the sella should be opened, and then determining by a radiograph whether it is a safe position.* With the opening of the posterior sphenoidal wall a tumour may be exposed, or the bluish dura or cyst wall may come into view, and, on incision with the long bistoury of Hirsch, there is generally a gush of limpid yellowish fluid.

Modifications.—The operation as above described is founded on the work of Hirsch. Cushing varies the route of approach a little by making a sublabial incision, as in the operation of Rouge (Fig. 305, p. 760), so as to displace the nose upwards before proceeding to a submucous septal resection. Other operators remove the middle turbinals, and open the posterior ethmoidal cells, so as to secure a larger field of action for approaching the front of the sphenoid bone. Some surgeons think that by complete excision of the posterior third of the nasal septum they secure a better approach than by a submucous resection.

Results.—This operation is not disfiguring; it is less dangerous than operation by other routes, and there is less hæmorrhage. It is a very feasible operation in the hands of the expert rhinologist.

The record of the first 100 cases approached by the nasal route, in the hands of twenty-nine different operators, have been analysed by W. Hill, and shows an operation mortality of 24 per cent. A perusal of the works of Hirsch and Cushing, who are two of the surgeons to whom we are most indebted for the development of this operation, show that it is followed by substantial amelioration of some of the symptoms caused by disease of the pituitary body.

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INTRANASAL DACRYOCYSTOSTOMY

Obstruction of the lachrymal duct is an affection in the province of the ophthalmic surgeon, but the operation to relieve it by the nasal route can only be confided to the expert rhinologist. Much of the technique is similar to what is required in submucous resection of the septum (p. 170).

* T. H. Halsted, *Trans. Amer. Laryngol. Assoc.*, xxxvi., 1914, p. 220.

I do not propose to refer to such operations as Toti's, intended to relieve the stenosis of the tear-duct by approaching it from the outside. The operation which has met with most general acceptance has been evolved by J. M. West and Polyák. It is based on the view that the usual seat of dacryostenosis is in the tear-duct, and that relief can only be obtained by making a permanent opening from the nose into the sac above this point (Fig. 311).

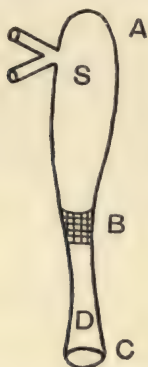


Fig. 311.—Semi-diagrammatic illustration of lachrymal apparatus.

S, Lachrymal sac; D, lachrymal duct; C, its opening into the nose; B, usual site of stenosis of tear-duct.

Operation.—The operation can be carried out under local anæsthesia with cocaine and adrenalin (see p. 75). The site of the sac corresponds to the area in front of the anterior point of attachment of the middle turbinate (Fig. 312). Here its bony margin may form a prominence, called the torus lachrymalis. In this area a quadrilateral flap of

muco periosteum (Fig. 312, B, A, C, D) is turned down and left

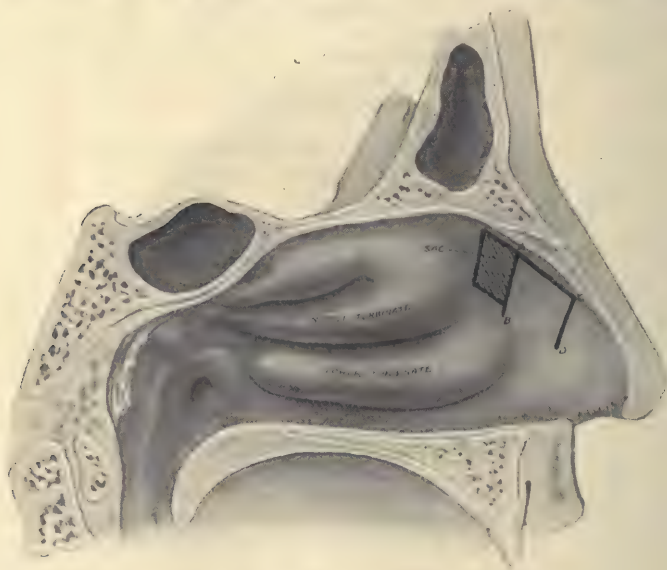


Fig. 312.—Intranasal dacryocystostomy.

B, A, C, D, Mucous flap which is temporarily turned down to gain access to the lachrymal sac. This is then exposed by removal of mucous membrane and bone. (J. M. West.)

attached at its base. Just behind it the muco-periosteum is removed over the bony wall of the sac, and the bone is chiselled away with a few blows on a curved chisel (Fig. 313). The sac wall is then exposed, and is verified by pressing against it a probe which can be felt externally. The inner sac wall is now seized

with fine-toothed forceps (Fig. 314), pulled towards the nasal cavity, and part of it excised by a long thin bistoury or a pair of scissors. A Bowman's probe introduced from the canaliculus will now appear in the nose, and a fine-pointed lachrymal syringe inserted through the puncture will wash the sac out into the nose.

Fig. 313.—Intra-nasal dacryocystostomy: Muco-periosteum detachers and curved chisels.

The muco-periosteal flap which was turned down—simply to secure free access to the field of operation—is now replaced in position and retained there by a little packing.

Occasionally an ethmoidal cell has to be opened before the sac is exposed, and in

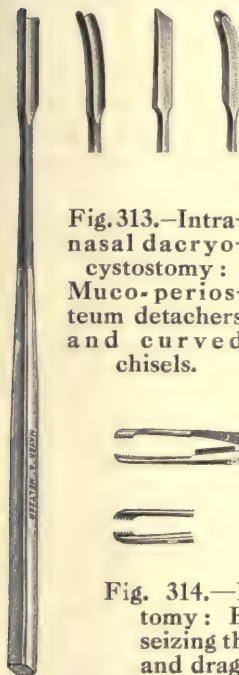
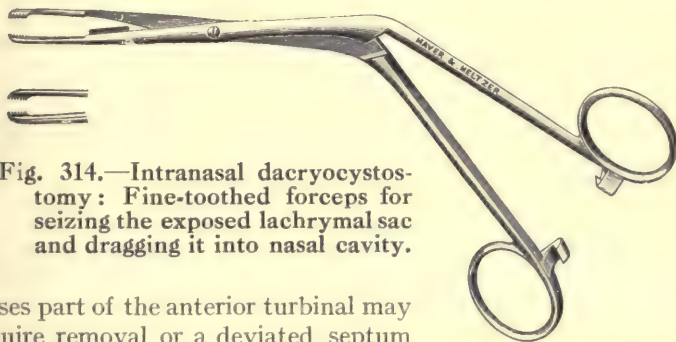


Fig. 314.—Intranasal dacryocystostomy: Fine-toothed forceps for seizing the exposed lachrymal sac and dragging it into nasal cavity.



some cases part of the anterior turbinal may first require removal or a deviated septum may need resection to obtain free access.

Indications.—All troubles produced by dacryostenosis, viz. dacryocystitis, blennorrhœa, fistula, phlegmon, and epiphora.

Contra-indications.—Young children and very old people; stenosis or scarring of the canaliculi or puncture; epiphora due to hypersecretion or disturbance of the innervation of the lachrymal glands, as in Graves's disease, facial palsy, etc.

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INTUBATION

Intubation consists in the introduction of a metal or hard rubber tube into the larynx in order to maintain or dilate the air-channel. The method was invented by Bouchut in 1858, and perfected by O'Dwyer in 1880.

Instruments.—The instruments devised by O'Dwyer, or the outfit designed by Bayeux and manufactured by Collin of Paris, may be employed (Fig. 315).

Operation.—The tubes are numbered, or a gauge is supplied so that an instrument suitable to the age of the patient can be selected, according to the following scheme:—

Below 1 year old	.	.	.	Tube No. 1
From 1 to 2 years	.	.	.	„ No. 2
„ 2 to 3 „	.	.	.	„ No. 3
„ 3 to 4 „	.	.	.	„ No. 4
„ 4 to 5 „	.	.	.	„ No. 5
„ 5 to 6 „	.	.	.	„ No. 6

Larger sizes are supplied for adults, and are then frequently made of vulcanite instead of metal. As large a tube as possible should be employed, as it remains better in place, is less liable to be coughed out, facilitates the expulsion of false membrane (in diphtheritic cases), and acts better as a dilator (in cases of laryngeal stenosis). Three tubes of likely size should be selected, sterilized, threaded with stout silk, and lubricated with glycerin or mentholized oil.

An assistant and a nurse are required. The latter wraps the child in a sheet, so as to envelop both arms and legs, and seats him on her lap, fixing his legs between her knees. With her left hand she holds the child's body and restrains his arms, while her right hand on his forehead keeps the head firmly fixed against her chest (Fig. 38, p. 45). The assistant stands behind the nurse to help in steadying the child, while he introduces the gag from the left side.

The surgeon's left forefinger is now passed down to the base of the tongue until he feels the epiglottis, which, in a child, readily

doubles backwards over the orifice of the larynx. The tip of the examining finger then tilts the epiglottis forwards into place, and locates the entrance of the larynx (Fig. 316). With the right hand the surgeon takes the introducer and carries the tube towards the larynx, first horizontally, and then vertically, until the tip is felt between the pulp of the examining finger and the epiglottis (Fig. 317).

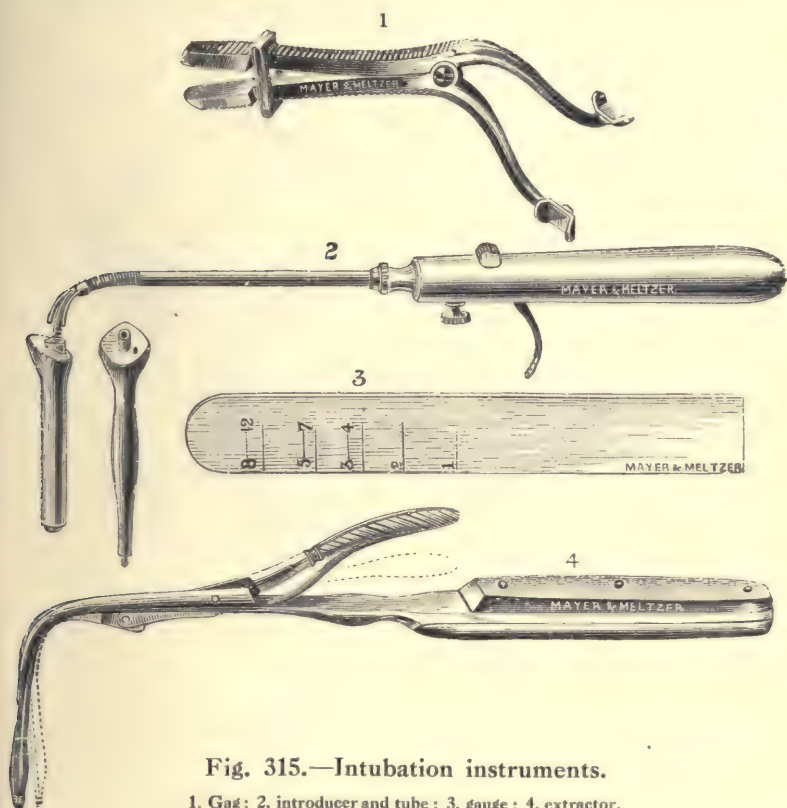


Fig. 315.—Intubation instruments.

1, Gag; 2, introducer and tube; 3, gauge; 4, extractor.

Keeping strictly in the middle line of the body, the tube is slipped downwards and forwards into the larynx. The left forefinger is now swept round the back of the larynx, to make sure that the tube is well in place, and not in the œsophagus, and it then returns to keep the right side of the head of the tube fixed, while the obturator is withdrawn (Fig. 318). The examining finger, which has not lost touch of the head of the tube, now gently presses the

tube home, until the upper extremity is felt to fit snugly into the vestibule of the larynx (Fig. 319).

If the intubation has been successfully performed, air will be heard entering through the tube, and the dyspnœa abates. If the respiration is not relieved, and if the child can still cry, it shows that the tube has miscarried—passing generally into the œsophagus on the left side. It is wiser in cases of difficulty to make several short attempts rather than one prolonged effort.



Fig. 316.—Intubation.

With the left forefinger the operator locates the position of the entrance to the larynx, taking care that the very pliable epiglottis of a child is not doubled back.

The silk thread is fixed by strapping to the cheek. Some operators divide and remove it at once.

Sojourn of tube.—In cases of diphtheria the tube is not left in place more than five days, and is dispensed with earlier if possible (*see* p. 733). In the case of adults, when used as a dilator, it may be possible to leave an intubation tube for months without changing (*see* p. 574).

Difficulties.—Edema of the larynx may be present, or be caused by rough manipulation. A smaller tube may then be necessary, or tracheotomy may be preferred.

Spasm of the glottis can generally be overcome by waiting for an inspiration.

Accidents.—If the tube enters the œsophagus it is easily pulled out by the silk thread. Traumatic false passages are very rare.

Syncope or asphyxia must be forestalled.

The descent of the tube into the lower air-passages is guarded

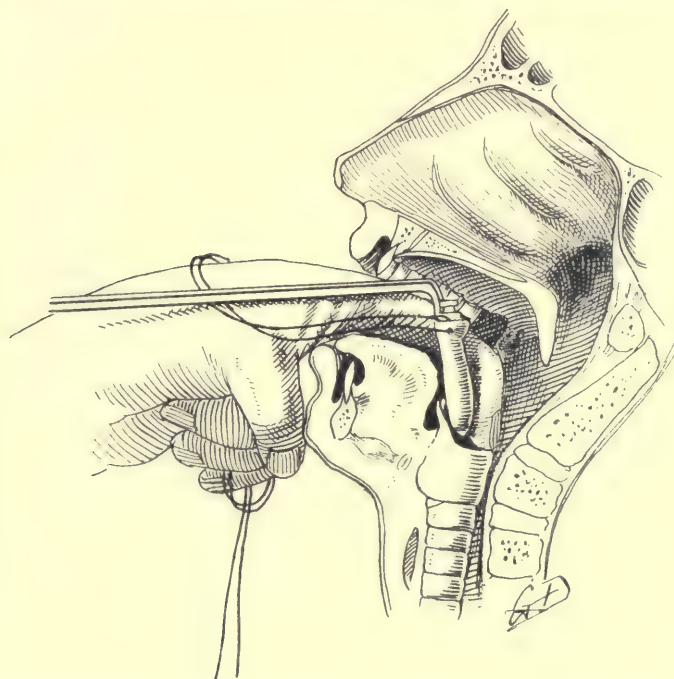


Fig. 317.—Intubation.

With the left forefinger still in position, the intubation tube is guided along it until the tip of the instrument is over the orifice of the larynx.

against by using as large an instrument as possible. Should it occur, a tracheotomy must be performed at once, and other necessary steps taken (*see* p. 775).

Sudden blockage of the tube is not so common as might be thought. But the possibility is one reason for leaving the tube with a thread attached, as this allows of a nurse removing it promptly.

Expulsion of the tube.—This accident is not uncommon. The tube is apt to be coughed up as swelling in the larynx

subsides, or as the intrinsic laryngeal muscles become atrophied from disuse. It is guarded against by using as large a tube as possible.

Removal of the tube (extubation).—In cases of diphtheria, this is generally done on the third day (*see* p. 733). Extraction is readily effected by introducing the left forefinger along the thread until it is just over the larynx. By gentle traction on the string with the right hand—the left forefinger acting as a pulley

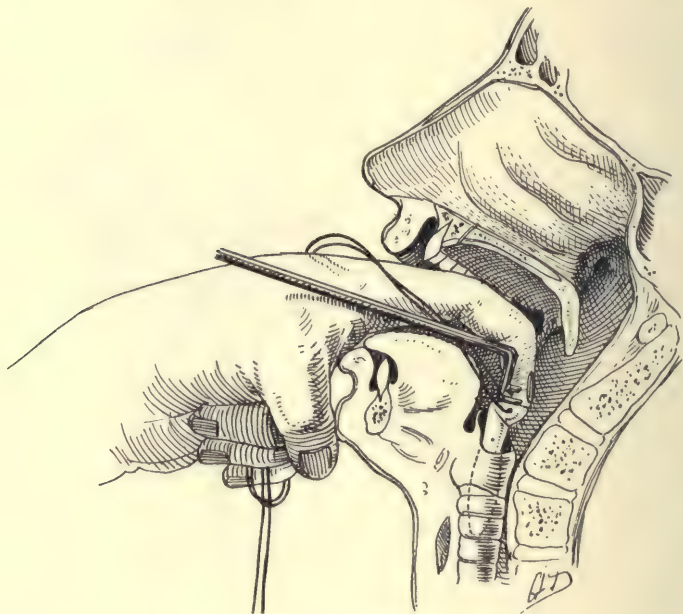


Fig. 318.—Intubation.

When the end of the intubation tube has entered the larynx, the tip of the operator's left forefinger is moved to assist in directing the tube downwards and forwards.

—the tube is drawn upwards and backwards until it leaves the larynx, and then forwards. If there is no string, the extractor is used on the same lines as those indicated for effecting the intubation.

Enucleation of the tube is in favour in France. The child's head is extended so as to render the larynx prominent. By applying the thumb and forefinger of the right hand on each side and below the cricoid ring, and then pressing upwards, the intubation tube can be shot into the mouth "like a stone from a plum."

After-treatment.—The patient should not be left for half an hour after extraction, in case of—

- (a) Œdema of the larynx, which might require introduction of a smaller tube.
- (b) Spasm of the glottis, with, possibly, convulsions.
- (c) Paralysis of the dilator (abductor) muscles of the larynx.
- (d) Subglottic false membrane.

All these events would require the reintroduction of the tube.

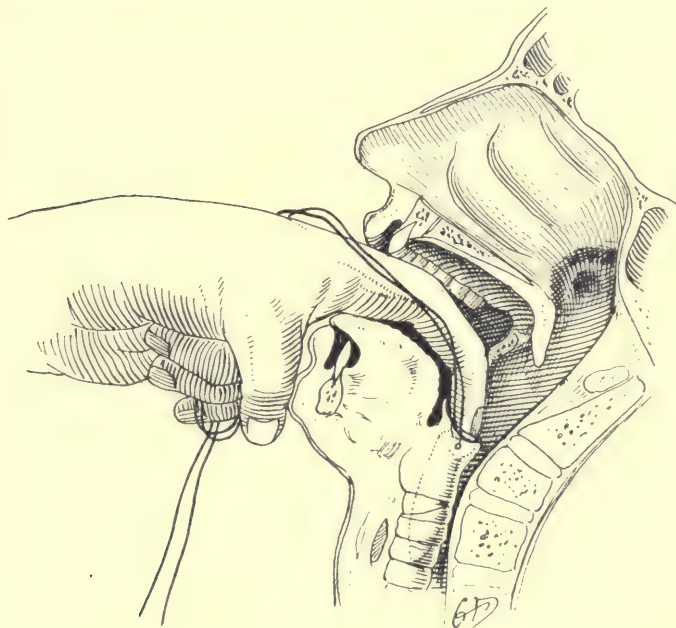


Fig. 319.—Intubation.

The left forefinger presses the intubation tube well home, until the shoulder is felt resting at the upper margin of the larynx. The tip of the finger is then swept round to make sure that the position is correct and that the tube has not entered the œsophagus.

During the operation, as well as in the early after-treatment, a tracheotomy outfit should always be at hand in case of emergencies.

Other details, so far as diphtheria is concerned, will be found at p. 732.

LARYNGOTOMY

Synonym.—*Intercricothyrotomy.*

A temporary opening through the crico-thyroid membrane (Fig. 321, c, p. 777) is indicated (1) in emergencies of sudden laryngeal stenosis, (2) when the necessary instruments for an urgent

tracheotomy are not at hand, or (3) as a preliminary and temporary measure in operations on the upper air-passages. This last indication is with the object of (a) making such operations less dangerous; (b) facilitating operation, by suspending the respiration through the mouth and so avoiding coughing and constant sponging; (c) allowing regular administration of the anæsthetic; or (d) avoiding a preliminary tracheotomy. Thus laryngotomy may help to make operations in the throat and nose more easy, rapid, and efficient. In other circumstances a tracheotomy is preferable. The operation is unsuitable for children, owing to the small size of the larynx (cf. Fig. 228, p. 483):

Laryngotomy is thus described by J. W. Bond: The patient's head is extended and held straight in the middle line. (1) An assistant pinches up a vertical fold of skin, so that the centre of



Fig. 320.—Laryngotomy tube.

it is at the level of the upper border of the cricoid cartilage when the head is extended. (2) The centre of this uplifted fold is then transfixed and cut through so as to make a transverse cut 1 inch in length. (3) A pair of sharp-pointed scissors, curved on the flat, is plunged through the crico-thyroid membrane downwards and backwards in the middle line, keeping close to the upper border of the cricoid, so as to avoid the small transverse artery. The scissors are then opened widely. (4) The laryngotomy tube (Fig. 320) is inserted between the blades of the widely opened scissors, the left forefinger-nail acting as a guide. Any bleeding is checked by the insertion of the laryngotomy tube. The laryngotomy tube is flatter than a tracheotomy tube cannula, and is fitted in a movable collar. It is supplied with a fairly sharp pilot, and the tube should project beyond the plate externally, so as to allow of the anæsthetist fixing an indiarubber tube for the administration of the chloroform. A small Durham's tracheotomy tube would do instead.

If more haste is demanded, a knife is held short, and is plunged transversely at one stroke through both skin and crico-thyroid membrane (Fig. 321, c, p. 777). The knife-blade is left in the opening until it has acted as a guide for a pair of dressing forceps, a hair-pin, or the quill of a toothpick.

A tethered sponge can now be firmly packed into the lower pharynx, or the top of the larynx can be packed in the following manner: The eyelet end of a long bent probe is passed up through the laryngotomy wound into the mouth, where it is threaded with one end of a double tape attached to a small sponge. The sponge can then be pulled down and firmly fixed in the larynx by tying the lower end of the tape to the upper half, which is brought out through the mouth.

Laryngotomy can be done in a few seconds, does not open up the tissues of the neck, is free from danger, and easy to perform. The wound will heal in a few hours.

After-treatment.—This will depend on the cause of the obstruction. The operation, in any case, is only a temporary expedient, and, if it is necessary to leave in a tube for any time, it is better to perform a tracheotomy and allow the laryngotomy wound to close.

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TRACHEOTOMY

Indications.—1. Injuries to the larynx—wounds and fractures of the laryngeal cartilages.

2. The extraction of foreign bodies when these are impacted in the larynx, or cannot be removed from the trachea or bronchi by the endolaryngeal route:

3. Stenosis of the larynx or trachea (*see* pp. 574 and 583).

(a) External compression: goitre, aneurysm, mediastinal growths (*see* p. 583).

(b) Internal constriction: inflammatory swelling, tuberculosis, syphilis, diphtheria, scleroma, neoplasms (carcinoma, papilloma, etc.).

(c) Cicatricial narrowing, after healing of ulcers (syphilitic, typhoid, etc.) or operative measures.

(d) Congenital webs in the larynx.

(e) Double abductor paralysis.

4. (a) As a preliminary procedure to operations on the upper air-passages, so as to prevent (by a tampon cannula or by plugging the larynx) the descent of blood into the bronchi. (b) Following these operations, to supply air to the patient.

5. In asphyxia, to allow of artificial respiration.

Surgical anatomy.—The trachea is situated exactly in the middle line of the body. The laryngeal end of the tube lies close

below the superficial structures of the neck. The suprasternal part of it is much deeper, for, in addition to the two layers of cervical fascia crossing from the muscles of one side to those of the other, it is separated from the skin by a considerable layer of cellular tissue containing numerous veins. The muscles overlap the sides of the trachea, but in the middle line they leave a strip of trachea covered only by the cervical fascia. The thyroid gland lies on each side of the trachea, the isthmus crossing between the 3rd and 4th rings. The opening made into the trachea above the isthmus is called a high tracheotomy, that below the isthmus a low tracheotomy (Fig. 321). But in practice the operation does not necessarily fall into one or other of these divisions, as it is often necessary to carry the incision through the thyroid isthmus. This latter opening—median tracheotomy—is required when a tampon cannula is introduced as a first step for operation on the larynx. Of the sixteen to twenty rings of the trachea, not more than seven or eight are above the manubrium sterni. The distance between the cricoid cartilage and the sternal notch varies with the length of the neck, the age of the patient, and the position of the head. In the adult it is about $2\frac{3}{4}$ inches (7 cm.), whereas in a child of 3 or 5 it will be about $1\frac{1}{2}$ inches (4 cm.).

Anæsthesia.—Tracheotomy in adults can be well performed under the local anæsthesia secured by an endermic injection of novocain with the addition of a small amount of adrenalin (*see* p. 78 and Fig. 322).* This renders the operation almost bloodless and practically painless, except for the disagreeable dragging sometimes entailed by a blunt dissection of the layers of fascia—there is no pain in making the knife incisions. It is greatly to be preferred when there is any decided stridor; indeed, in a patient already cyanosed an anæsthetic is not required—the sensitiveness to pain being then considerably diminished—and would be extremely dangerous, particularly in adults.

General anæsthesia is reasonably safe in children, even in acute disease. It can, of course, be given without hesitation in adults when there is no dyspnœa, as in the first step of a laryngo-fissure. Chloroform alone appears to be the best anæsthetic, as it is in all laryngeal and pharyngeal cases where it is desirable to avoid irritation and increased secretion from the mucous membrane. It should be given slowly, so as to avoid any sudden increase of dyspnœa, and the anæsthesia need seldom be profound. The administration should be discontinued, and the patient allowed to recover partially, before the trachea is opened. The operation

* StClair Thomson, "Tracheotomy under Local Anæsthesia," *Brit. Med. Journ.*, Oct. 11, 1905.

is then practically finished, and his restored consciousness enables the patient to sit up and assist matters by coughing up any blood or mucus which may have been inhaled.

In some cases the injection of a local anæsthetic may be followed by a light dose of chloroform, just enough to numb the patient's sense of apprehension, which forms a great portion of his suffering.

As soon as the trachea is exposed, and a few minutes before it is opened, it is a good plan to anæsthetize the inside of the windpipe in the following way: An ordinary hypodermic syringe is charged with cocaine ($2\frac{1}{2}$ to 5 per cent.), the needle is stabbed between the rings so that the point is free in the lumen of the windpipe, and some 15 to 20 drops are there injected. This checks reflex irritability so effectively that the incision in the trachea can be made five to ten minutes later, and the tube inserted, without the violent inspirations and explosive coughs which are otherwise so apt to ensue: In children, only 3 or 4 drops should be used, and in infants it is best to avoid cocaine entirely (*see* p. 71).

HIGH TRACHEOTOMY

This is the operation in most frequent use. As the trachea is more accessible above the thyroid isthmus the operation can be done rapidly, and there is less risk of injuring important structures. It is suitable for temporary laryngeal stenosis and foreign bodies in the larynx.

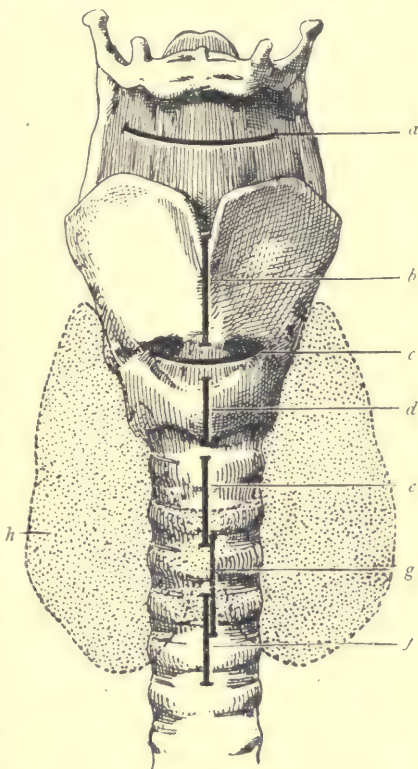


Fig. 321.—External operations on the larynx and trachea.

Semi-diagrammatic drawing showing the position of various openings which may be made into the larynx or trachea. *a*, Sub-hyoid pharyngotomy; *b*, splitting the thyroid cartilage in laryngo-fissure (thyrotomy); *c*, laryngotomy; *d*, cricotomy; *e*, high tracheotomy; *f*, low tracheotomy; *g*, median tracheotomy (the dotted line is placed a little to one side for the sake of clearness in the drawing; the opening is, of course, made in the middle line); *h* indicates the thyroid gland, and shows the relation of the isthmus to the tracheal rings and to the three forms of tracheotomy.

The patient lies on his back, close to the right edge of the table, and in a good light. It is still better if the surgeon is armed with a frontal electric searchlight, and the room darkened (p. 15). A child should be enveloped in a thin mackintosh sheet, which serves to restrain the arms. A small square pillow or sand-bag, a folded bath towel, or a good-sized block of wood is placed beneath

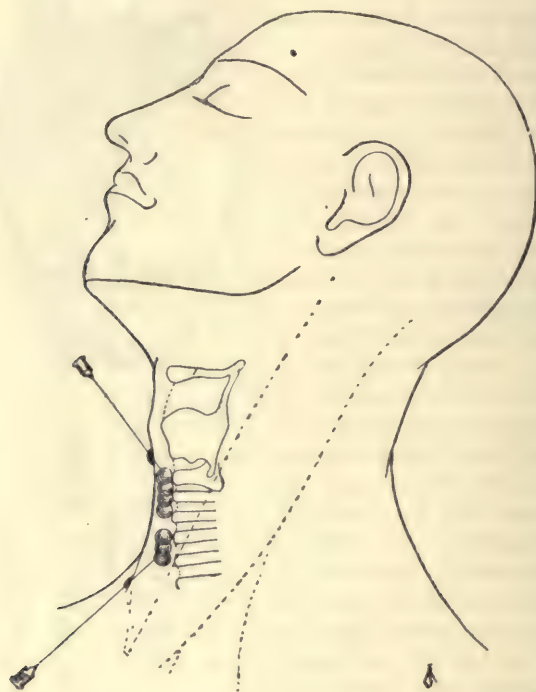


Fig. 322.—Tracheotomy under local anæsthesia.

Semi-diagrammatic drawing showing the spots on the skin where a drop of pure carbolic acid is deposited. The needle is inserted through these points, and the cocaine-adrenalin or eudrenine solution is slowly injected.

the shoulders, so that the head falls well backwards, the neck is over-extended, and the trachea is projected forwards. If the occiput does not quite rest on the table, a folded towel should be placed beneath to give support and steadiness. It is of great importance for the safe and easy execution of the operation that this position be assured, and throughout the operation the chin and the sternal notch should be rigidly kept in the mid-line of the body. This is best done by letting one assistant

support the head and devote himself entirely to maintaining this position.

Operation.—Standing on the patient's right, the operator grasps the sides of the larynx with the thumb and second finger of the left hand, the forefinger as a guide resting on the notch of the thyroid cartilage. A bold incision about 2 inches long is made exactly in the middle line from the front of the crico-thyroid membrane to below the level of the thyroid isthmus. Skin, platysma, and thin superficial fascia are cut through with the first stroke, and the more tense fascia of the neck is reached and divided with a few straight cuts of the knife or on a grooved director. The inner borders of the muscles, running from the larynx to the sternum, come into view and should be defined and separated with the handle of the scalpel and carefully retracted to an equal extent on both sides by an assistant. The situation of the trachea is verified from time to time by palpation with the forefinger of the left hand, while the thumb and second finger of the same hand continue to steady the larynx and hold it exactly in the middle line. In this way, the anatomical landmarks are not lost. The cellular tissue in front of the trachea can now be cleared by plucking it aside with a pair of dissecting forceps in each hand. A still deeper fascia is reached extending from the thyroid isthmus up over the front of the trachea. This is detached from the lower border of the cricoid cartilage, the thyroid gland is hooked downwards, and the front of the trachea is thoroughly exposed by dissection. The cricoid cartilage must be recognized by touch and sight, and more of the upper tracheal rings are cleared than it is intended to open. Twenty drops of a weak cocaine solution are injected into the lumen of the trachea, as described on p. 777. If possible, all bleeding vessels should be carefully secured. A sharp hook is now inserted in the mid-line, under the cricoid cartilage, or—better still—between the first and second rings of the trachea. By slight traction on the handle an assistant is able to raise and steady the trachea. The operator shortens the grasp of his knife, so as to grip the blade about half an inch from its extremity. Cutting from below upwards, two or three rings are incised. As the trachea is steadied and held forwards with the sharp hook, the cannula is introduced. It is still better to seize the right edge of the wound with small toothed dissecting forceps, otherwise much time is lost in hunting for the slit-like opening.* The tracheotomy tube should be introduced at once, but if this is prevented by a violent attack of coughing or

* Treves and Hutchinson, "A Manual of Operative Surgery," vol. ii. London, 1910.

by the wound becoming obscured by blood and expectoration, the operator can wait until the respiration is calmer—unless there is any threatening of asphyxia.

If no assistant is at hand, the single hook can be inserted under the cricoid in the middle line and held in the operator's left hand. When the hook is not available, the trachea is held as firmly as possible with the fingers while it is being opened, and then the nail of the left forefinger or the handle of the knife is slipped in between the edges of the incision, so as to tilt one side over the other while the tube is slipped in.

The hook is not removed until the cannula is safely in position. The cannula is at once secured with tapes. The cutaneous wound is reduced by a few horse-hair or silkworm-gut sutures.

Some operators prefer to use two sharp hooks, inserted into the trachea, one on each side of the middle line, so that the incision into the windpipe is made between them.

LOW TRACHEOTOMY

Indications.—This is more suitable for reaching foreign bodies in the bronchi, and also when tracheotomy is required in epithelioma or tuberculosis of the larynx, as the wound is not so likely to get infected. The position of the patient is the same as for high tracheotomy.

Operation.—The cutaneous incision extends from the lower border of the cricoid cartilage to the suprasternal notch. Skin and subcutaneous tissue are cut through, the superficial layer of the cervical fascia is exposed and divided, and a considerable area of loose connective tissue is then cleared with two pairs of dissecting forceps before the inner margin of the sterno-hyoid muscles is defined and the deep layer of cervical fascia reached. This must be divided before the trachea can be properly isolated and its rings defined. During this blunt dissection some thyroid veins may require clamping, and the situation of the trachea should be frequently verified by palpation with the index-finger of the left hand. All bleeding points are ligatured before inserting one or two sharp tenacula into the trachea. An assistant holds the windpipe well forward while it is opened from below upwards, as in high tracheotomy.

Difficulties with the low operation.—In the low operation the anterior jugular vein and its branches are larger. The inferior thyroid veins and thyroidea ima may be wounded. The great vessels are more exposed to danger, and, in infants, the thymus. The trachea is much deeper, and is more mobile. The anterior

mediastinum might be opened. It is therefore safer to employ two sharp hooks for steadying and lifting the windpipe.

Difficulties may arise from the neck being very short, the adipose tissue excessive, the veins engorged, the thyroid gland enlarged, or the operation hurried from threatened suffocation. Tracheotomy, as above described, with skilled assistance, the patient anæsthetized, and no necessity for urgent haste, is unattended with difficulty or anxiety. It is a very different proceeding if the operator is single-handed, the patient a plethoric, short-necked man, or a small, fat-necked baby, and if the operation has to be done swiftly for urgent dyspnœa or sudden asphyxia. The dissection is then deep and difficult, the veins are gorged with blood, the patient may be restless, and the operator requires all his presence of mind not to lose track of the trachea. It is then better to do the high operation first, or divide the prominent cricoid, or perform a simple laryngotomy (p. 773), then introduce a cannula, and wait until the respiration becomes regular, the cyanosis subsides, or secretions are expelled. The front of the neck can then be dissected without haste, and the low tracheotomy completed.

MEDIAN TRACHEOTOMY

The classification of tracheotomy into the "high" and the "low" operation is rather a survival from the days when surgical technique and our resources for checking hæmorrhage were not so complete as they are at present. As already remarked (p. 776), it is sometimes preferable to perform the "median" operation, and often more rational. For there are seven or eight rings of the trachea available in the neck for our incision, and it is more practical and surgical to select the third and fourth rings than to attempt the "high" operation and risk injuring the cricoid cartilage, or face the difficulties at the root of the neck in carrying out the "low" operation. Now, the third and fourth rings are conveniently situated, except that they lie behind the isthmus of the thyroid gland. But this need not be a hindrance, for, once the cleft between the sterno-hyoid muscles has been defined, the thyroid gland is recognized as a deep-pink, fleshy mass which bulges forwards between the dark-red muscle fibres. The fascia in which the isthmus is slung is now divided along its upper border, when it will be found quite easy to thrust the handle of a pair of dissecting forceps from above downwards, undermining the isthmus, pushing it forwards and lifting it from the third and fourth rings of the trachea, which are thus left quite bare. The isthmus is clamped with two pairs of pressure forceps and then

divided between them (Fig. 329, p. 790). It is well to tie the divided isthmus on each side with a stout ligature. If this is neglected, the escaping thyroid juice may be absorbed, and may cause rapid pulse, high temperature, and alarming symptoms.

The third and fourth rings of the trachea, which are cleanly exposed by this method, can now be deliberately incised, and the operation completed as already described.



Fig. 323.—Photograph to show the relative positions of a thyro-laryngotomy and a low tracheotomy. (*Proc. Roy. Soc. Med.*, Laryngol. Section, March 4, 1910.)

“Stabbing” the trachea.—In cases of great emergency the trachea can be opened with one stroke of the knife. It is thus described by Lack :—

Seize the larynx firmly with the left hand, forcing the thumb and index finger, which point downwards, as far as possible behind it. By this means the windpipe is steadied and pulled forwards, and the skin rendered tense. Now enter the blade of the knife straight down into the trachea about the level of the first and second ring. This must be done carefully, and, as soon as the point is felt to be in the

cavity of the windpipe, cut carefully upwards for about half an inch. Withdrawing the knife, insert the finger into the trachea, and as the finger is withdrawn insert the cannula.*

General directions worth bearing in mind.—1. If urgency permits, everything should be prepared beforehand, and within reach of the surgeon's own hands.

2. The "tracheotomy position" must be carefully arranged.

3. The cutaneous incision should be liberal, as it facilitates separation and seizure of the veins.

4. During the early part of the operation the surgeon should not lose his grasp of the larynx with the thumb and second finger of the left hand. The forefinger can descend from time to time to verify the situation of the trachea and palpate the rings.

5. If at any time the relationship of the parts becomes confused they should be allowed to resume their natural position, and, starting from the larynx, the situation of the trachea can again be verified.

6. No attempt should be made to enter the trachea until it has been seized with a tenaculum. When there is no assistant, the hook should be introduced in the middle line, and held in the operator's left hand, while he incises the rings with the right.

7. Although, if possible, all bleeding should be checked before the windpipe is opened, this need not be adhered to in the presence of urgent dyspnœa, for once the cannula is introduced the venous congestion rapidly subsides as free respiration is established. If the hæmorrhage continues, it is a good plan to roll the patient well over on his side, so that the blood does not find its way into the lungs. In this position respiration becomes normal, the hæmorrhage diminishes, and can easily be checked by pressure- or catch-forceps.

8. If some blood does enter the trachea and the patient struggles to expel it, he should be allowed, if not under a general anæsthetic, to sit up.

9. The intratracheal use of a weak solution of cocaine, described on p. 777, will render the incision of the trachea and the introduction of the cannula quite a calm and deliberate proceeding. It would be better to avoid it if hæmostasis is not complete and there is any risk of blood being sucked into the windpipe.

10. A child may cease breathing soon after the trachea is opened, and this naturally alarms the young operator. As a rule this is really a condition of apnœa consequent on the exceptionally deep breath inhaled as soon as the opening was made. If the patient is

* *Clin. Journ.*, Feb. 5, 1896, p. 227.

left alone, quiet respiration is soon resumed. Artificial respiration is very rarely required.

A brief enumeration of the accidents which may attend tracheotomy will indicate the dangers to be avoided:—

1. The opening in the trachea may not be made in the middle line.

2. If the opening is incomplete, the cannula may make a false passage for itself beneath the mucous membrane.

Under 2 years.  5 mm.

2 to 4 years.  6 mm.

4 to 8 years.  8 mm.

8 to 12 years.  10 mm.


12 years onwards.  12 mm.

Fig. 324. — Section of tracheotomy tubes in relation to age.

It is seldom that a tube with a larger diameter than 10 mm. is required. This is the largest stock size of Durham's tubes.

3. If the knife is not held carefully it may not only open into the wind-pipe, but traverse the opposite side.

4. The trachea may be entirely missed, and the œsophagus or some other structure opened by mistake.

5. The cannula may fail to enter the wound in the trachea, and may slip down in front of it and below the fascia.

6. The tube may be of the wrong shape or size, or its orifice may become occluded by membrane. While a suitable tube is being selected, or the trachea cleared, the wound should be kept open by retractors or a dilator.

7. There may be difficulty in introducing the cannula. Clumsy efforts to force the tube into the trachea should never be made. Before opening the trachea, the surgeon should bear in mind the size of tube he intends to employ and make the incision

sufficiently free. With the aid of two sharp hooks the introduction is much facilitated. Sometimes the opening in the trachea can be eased by nicking both ends of it. When the tube is inserted it should not be pushed straight in, but "passed" in from the side like a bladder catheter.

Tracheotomy tube.—With regard to the diameter of the tube, it should be 10 to 15 mm. for adults; under 12 years of age smaller sizes are used. (Fig. 324.)

Various forms of tracheotomy tubes are employed. The older ones in the form of a segment of a circle are apt to cause ulceration by pressing with the lower end on the anterior wall of the trachea.

The bivalve tube is unsuitable for permanent use owing to its sharp edges, but it is very useful for emergency cases, as it can readily be introduced. Parker's tube is a useful form for children (Fig. 325), Durham's lobster-tailed cannula is well suited for adults, or when the low operation is employed, or when a tube must be worn for some time (Figs. 326 and 327).

When a tracheotomy tube has to be worn indefinitely, the patient is sometimes compelled to close the orifice with his finger each time he wishes to speak. In patients who have sufficient space for expiration through the larynx, although not enough room for inspiration, the tube can be fitted with a valve arrangement which opens on inspiration, so that the patient breathes through this tube, while on expiration the valve closes tightly and air passes through the larynx. Such tubes have been designed by De Santi* and W. Heywood.†

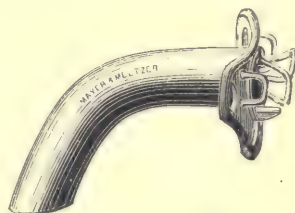


Fig. 325.—Parker's tracheotomy tube.

After-care.—Before being introduced the tube should be threaded with tapes which are passed round the neck and tied at one side, but not so tight as to cause any constriction. The wound is dressed with a piece of boric lint thickly spread with boric ointment, and slit so as to allow of its being hitched in below the shield of the tube, which thus keeps it in place. A handful of loose gauze wrung out of hot water is placed over the orifice of the tube, and changed whenever it becomes soiled.

The old-fashioned "steam tent" is only harmful. At first a nurse should be constantly on duty to wipe away any material that is coughed up, so that it may not get sucked back into the trachea; to see that the tube does not get displaced; and to remove and cleanse the inner tube when it becomes clogged. The outer tube should be left in position for the first seven days, and afterwards it should be removed once a week or oftener if there is much discharge. When there is little or no discharge, it may be sufficient to change the outer tube every two to four weeks. No time must ever be lost over cleaning and replacing the cannula: otherwise, especially in children, the wound in the neck may contract so rapidly that some force, entailing pain and bleeding,

* *Proc. Laryngol. Soc., London*, iii., May, 1896, p. 94: and *Lancet*, July 25, 1896, p. 238.

† *Ibid.*, v., Nov., 1897, p. 1.

may be required to get the tube back. In such cases a second tube should be ready for immediate introduction, so that the first one can be thoroughly cleansed, boiled, and fitted with fresh tapes.

The patient must at first be carefully fed with a spoon, as tracheotomy often induces some anæsthesia of the larynx, and nourishment may enter it, setting up violent spasm, or run out through the cannula, or descend into the bronchial tubes. It is

well to begin with sips of boiled water, until the power of swallowing is assured.

The pain of swallowing sometimes induces children to refuse food, and they must then be fed by a rubber tube through the nose or by the rectum.

The length of time a tracheotomy tube must be worn will depend on the condition for which it is inserted. After successful removal of a foreign body, the tube should only be kept in for a few hours. If removed at once, subcutaneous emphysema may occur, but after a few hours the tissues are sufficiently agglutinated to prevent this.

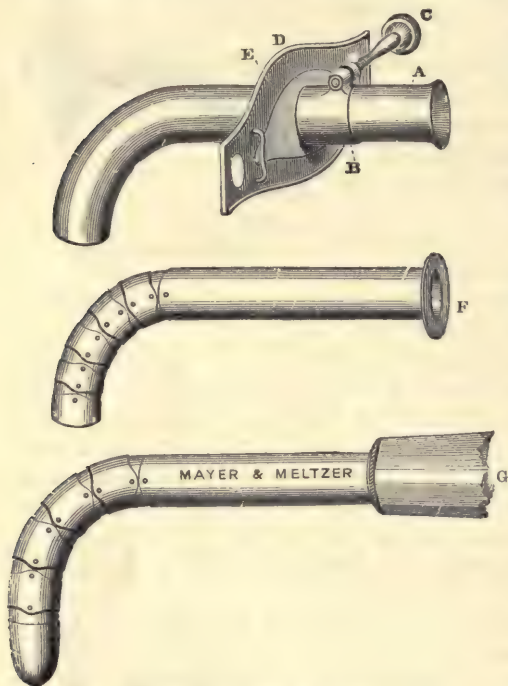


Fig. 326.—Durham's lobster-tail tracheotomy tube.

A, The cannula; B, movable collar; C, screw to fix the collar; D, plate of collar; E, movable shield; F, inner tube; G, lobster-tail introducer (the "pilot").

In cases of diphtheria the tube should be discontinued as soon as possible; otherwise stenosis may occur in the disused larynx, granulations followed by cicatricial webs may arise, or the child may lose the habit of breathing through the larynx. Even when the larynx is quite free, a nervous child may get laryngeal spasm at the mere thought that he is without a tube. To restore confidence, he should be encouraged to blow a whistle or trumpet, or blow out a light. A more or less complete obturator may be slipped

into the orifice of the cannula during sleep, or it may be partially plugged during the day. Cautious attempts are then made to do without the tube. In the first instance this is only done in the presence of the surgeon, and for periods not exceeding half an hour.

When the tube has to be worn indefinitely, as in some cases of double abductor paralysis, cancer, syphilis or tubercle, special care is taken to avoid irritation and ulceration in the trachea. The flexible rubber tube known as Morrant Baker's may then be employed, although, on account of its softness, it should not be used until the opening has been fairly established. Durham's

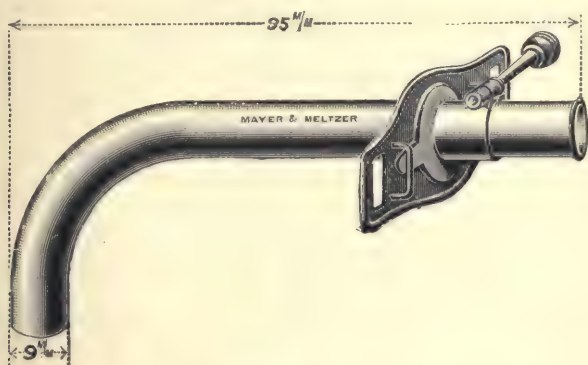


Fig. 327.—A large-size Durham's cannula, recommended by the author in the case of a low tracheotomy in a stout subject.

lobster-tail tube is, however, the most suitable, as the shield can be moved to fit the depth of the neck, and the extremity is pendulous in the trachea and can exert no pressure (Figs. 326 and 327).

The permanent wearing of a tracheotomy tube is generally thought to be associated with considerable risk, and with predisposition to bronchitis and other respiratory troubles. Still, a case is recorded where a patient died of senile decay at the age of 81, after wearing a tube for over fifty years. In this instance the same tube would sometimes serve for sixteen years, and was even worn unchanged for two years on end! * Of course, this was courting disaster. A tube should be taken out and well purified at least once a month, particularly as a silver tube readily tarnishes, wears, and cracks.

* W. A. Berridge, *Brit. Med. Journ.*, April 6, 1912, p. 816.

THYROTOMY OR LARYNGO-FISSURE

Indications.—Splitting the larynx, so as to deal directly with intralaryngeal conditions, may be required for—

1. Impacted foreign bodies in the larynx.
2. Injuries to the larynx.
3. Laryngocele.
4. Stenosis of the larynx.
5. Acute laryngeal perichondritis.
6. Laryngeal tuberculosis, including lupus.
7. Scleroma of the larynx.
8. Neoplasms in the larynx—(a) innocent, and (b) malignant.

Anæsthesia.—The operation is generally performed under chloroform. It can be successfully carried out under local anæsthesia (Fig. 322, p. 778); but, having tried this, and having performed a considerable number of laryngo-fissures, I see no advantages in local anæsthesia to compensate for the shock, and for the mental and moral strain to which it exposes both patient and surgeon.

Operation.—The mouth having been purified, the patient is placed in the tracheotomy position (p. 778). It is a great convenience if the operating table is one which can be converted into the Trendelenburg position, which may be required in the event of unexpected hæmorrhage, or if the operation has to be converted into a partial or complete excision. The surgeon does well to arm himself with a frontal electric searchlight (p. 15).

An incision is made from the hyoid bone to the sternal notch (Fig. 328), and, keeping strictly in the middle line, the soft tissues are divided until the front of the thyroid cartilage, the cricoid, and the trachea are laid quite bare. The thyroid isthmus is defined, divided in the centre, and held aside (Fig. 329). Ten to twenty drops of a 2½ per cent. solution of cocaine are injected, between the rings, into the lumen of the trachea (cf. p. 777). All bleeding is completely controlled before a median tracheotomy is performed (p. 780). If chloroform is being given, the anæsthetic during the rest of the operation is administered through the tracheotomy tube.

The thyroid cartilage is now divided carefully in the middle line with strong, obliquely bent, short, cutting pliers, or Irwin Moore's shears (Fig. 330). In elderly subjects the cartilage may be so ossified that a small nasal saw is required. As the divided *alæ* are held aside, a tag of mucosa may require dividing before the interior of the larynx is revealed. Any neoplasm is at once seen to be larger and deeper than was expected. The laryngeal mucosa is immediately swabbed or sprayed with a 5 per cent. solution of cocaine in adrenalin, to diminish reflex cough and spasm, check hæmorrhage, and numb sensation, so that a tethered sponge can be closely packed down through the thyroid incision, on to the convexity of the tracheotomy tube. This prevents any blood or mucus from passing down into the trachea. Another sponge may be passed upwards to keep the wound from being invaded by mucus from the pharynx (Fig. 331).

If firm but gentle use of the retractors does not give sufficient exposure the cricoid cartilage may be divided, but this is seldom

necessary and should be avoided. The interior of the larynx is then dealt with according to the circumstances of the case.

In the case of a malignant growth it is a good plan to pack the larynx for five or ten minutes with some ribbon gauze moistened with 5 per cent. cocaine in adrenalin, so as to facilitate operation and define

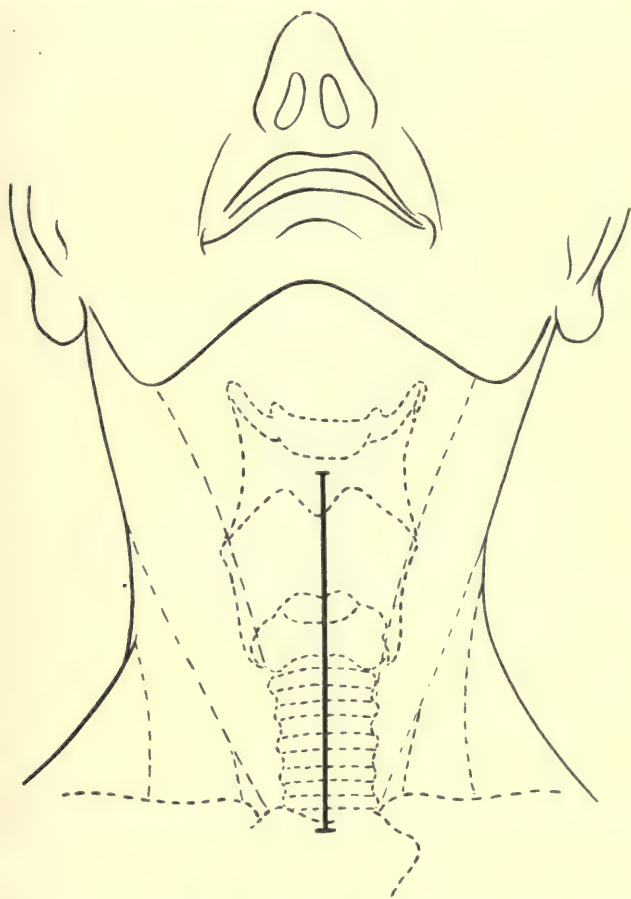


Fig. 328.—Laryngo-fissure.

Situation of the skin incision.

the boundaries of the neoplasm. When the divided alæ are well separated the inner perichondrium of the thyroid wing is stripped up from in front with a dull-pointed detacher (Fig. 107, p. 213), so as to undermine the growth. The neoplasm is thus raised like a miniature mass of flesh on a fleshy plate. With curved scissors this is cut through about half an inch from the growth, which is thus left

untouched by any instrument. In cases where the growth is farther removed from the line of the thyrotomy incision, the elliptic incision to surround the tumour is made so as to extend down through the perichondrium, which can then be peeled off the cartilage, first with a sharp elevator and then with a blunt dissector.* Care should be taken not to risk infecting healthy tissue with any instrument which has passed through a cancerous growth.

Before removing the sponges, or gauze plugs, any bleeding should be most carefully arrested and the patient may be allowed to recover

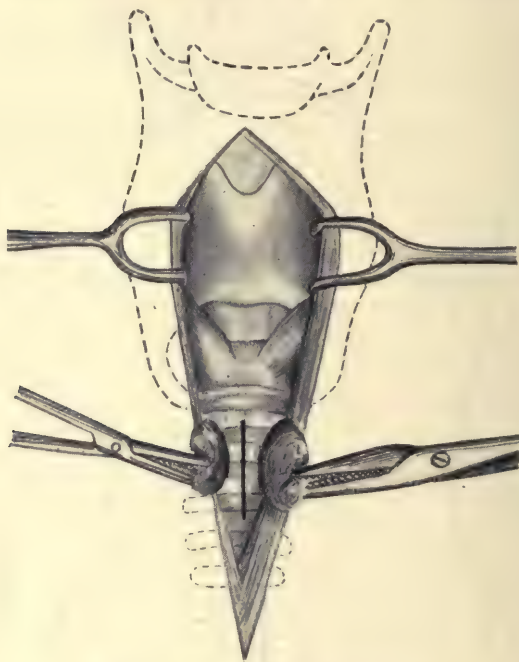


Fig. 329.—Laryngo-fissure.

The front of the larynx and trachea has been exposed, and the thyroid isthmus divided, and held aside by catch-forceps. The black line indicates the situation for incising the windpipe in median tracheotomy. (Cf. Figs. 321 and 330.)

consciousness partially, so as to cough and expel any mucus or blood which may have oozed past the tracheotomy tube. The divided halves of the thyroid cartilage are allowed to fall into natural position, and the perichondrium over them is drawn together with catgut sutures. The skin incision is then united by silkworm-gut or horse-hair stitches. The tracheotomy tube is finally removed, but there is no advantage in closing up the skin opposite the opening. The latter will close spontaneously after a few days, and in the meantime it gives rest to the larynx, allows of easy expectoration of blood and mucus, acts as a

* J. Solis-Cohen, *Laryngoscope*, May, 1907.

safety-valve in the event of hæmorrhage or laryngeal blocking, allows of speedy reintroduction of a tracheotomy tube, and prevents the patient from attempting to talk too soon. A pad of loose gauze is placed over the wound.

After-treatment.—The patient, when put back to bed, should be propped up in a sitting position. This attitude is always preferred by the patient, and it facilitates breathing and the expectoration of any

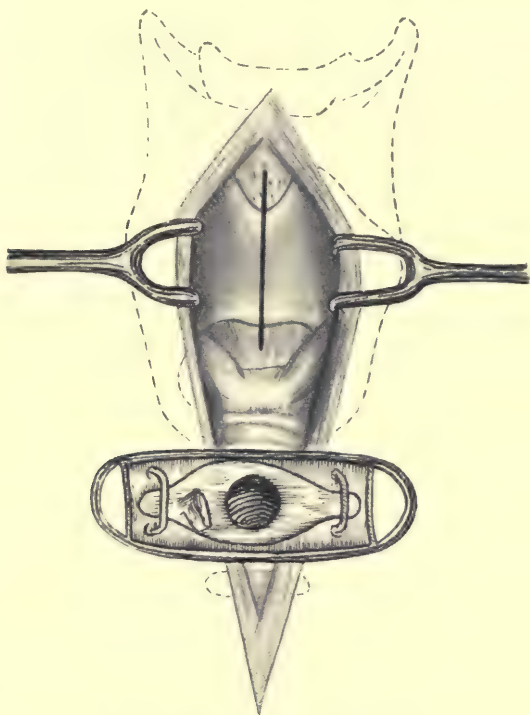


Fig. 330.—Laryngo-fissure.

The tracheotomy tube has been inserted. The black line indicates the incision for splitting the larynx.

mucus or blood. Within twelve hours, sips of sterilized water can be given, and, if these are swallowed successfully, feeding by the mouth can be continued. If deglutition appears unsafe, nourishment must be administered by a soft rubber stomach-tube introduced through the nose. A skilled assistant should be within immediate call for the first twenty-four hours. The patient may be out of bed in one to three days, and out of doors in one to three weeks. This plan of after-treatment, combined with freely-open windows day and night, is the best to prevent or treat any septic bronchitis or pneumonia.

During convalescence, or even some weeks or a month or two later, a small granulating mass is apt to appear in the anterior commissure,

or along the scar, and give rise to a suspicion of recurrence, if the operation has been done for cancer (Plate xvii., Fig. 2, facing p. 510). With rest it generally disappears, and is thus shown to be only a sprouting granulation on the healing surface. Anxiety is more quickly allayed by removing the mass intralaryngeally and submitting it to the microscope. (Cf. Figs. 242 and 242*a*, pp. 530, 531.)

If a vocal cord has been removed, strict silence should be insisted on for at least three weeks.

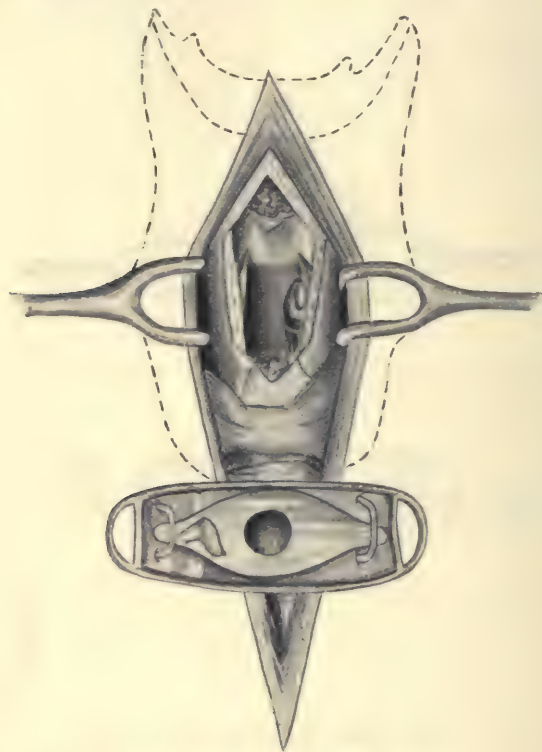


Fig. 331.—Laryngo-fissure.

The tracheotomy tube is in position. The larynx has been divided, and the two alæ are held aside. A sponge has been pressed down so as to block the trachea just above the cannula, and part of another is seen pushed up into the laryngo-pharynx. There is a growth on the left vocal cord.

Fragments of necrosed cartilage may, occasionally, be expectorated afterwards, or work out through the scar.

Modifications.—Instead of trusting alone to a gauze or sponge packing, pushed down on the tracheotomy tube from the opened larynx, it was formerly usual to employ a Hahn tube (instead of a tracheotomy tube) and allow ten minutes for the sponge on it to expand. At first this used to be left twenty-four hours *in situ*, and then replaced by a tracheotomy tube for several days. Butlin suggested immediate

removal of the Hahn tube, and Moure has found that no Hahn, Trendelenburg, or similar tube is required if the opening in the thyroid is packed as above described.* Sometimes a cautery was applied to the interior of the larynx, which was afterwards plugged daily for five or six days with iodoform gauze. Feeding for the first three or four days was effected by a soft œsophageal tube. All these details are irritating, dangerous, and have generally been abandoned.† Some surgeons open the larynx directly, without a previous tracheotomy; but the latter step is so free from any anxiety that it is only adding a risk to omit it.

Risks of operation.—The chance of septic bronchitis or pneumonia is slight. Any shock from the operation will not depend on the opening of the larynx, but on the further manipulations which may be required.

Counter-indications.—Among these are affections of the lungs, kidney, or heart, and old age—although patients over 70 have been operated on successfully.

UNILATERAL LARYNGECTOMY

Indications.—Hemilaryngectomy is required when malignant disease is confined to one side of the larynx, is too extensive to permit of the disease being removed by laryngo-fissure, but yet is sufficiently limited to hold out a promise of extirpation by removing one half of the larynx.

Operation.—A general anæsthetic is usually given, but I have carried out the operation successfully under local anæsthesia in a case in which several years have passed without any recurrence (Plate XVIII., Fig. 7, facing p. 520). The preliminary steps are those already described for laryngo-fissure (p. 788). At the upper extremity of the vertical incision a transverse cut is sometimes carried outwards over the thyro-hyoid membrane on the affected side. The soft tissues are peeled off the outer surface of the thyroid and the cricoid cartilages. The latter is then divided in the middle line both in front and behind, and separated from the first ring of the trachea, so that the half of the larynx can be cleared up laterally and posteriorly as far as the ary-epiglottic fold, and then removed. Blunt-pointed scissors, curved on the flat, will be found useful. All bleeding must be carefully checked. Glands, if present, are then removed through a separate incision in the neck.

The opening in the larynx is packed with gauze, which is changed daily for three or four days. The tracheotomy tube is, of course, retained until secretions can be expelled through the mouth.

Dangers.—As the lower air-passages are not cut off from communication above, as in complete laryngectomy, there is more risk of infection than in the latter operation.

* E. J. Moure, *Rev. Hebdomadaire de Laryngol.*, xxv., 1904, No. 23, p. 674.

† H. Butlin, *Proc. Laryngol. Soc., London*, Oct. 11, 1893, p. 28.

LARYNGECTOMY

This operation is so fully described in textbooks on operative surgery that only a short description is necessary.*

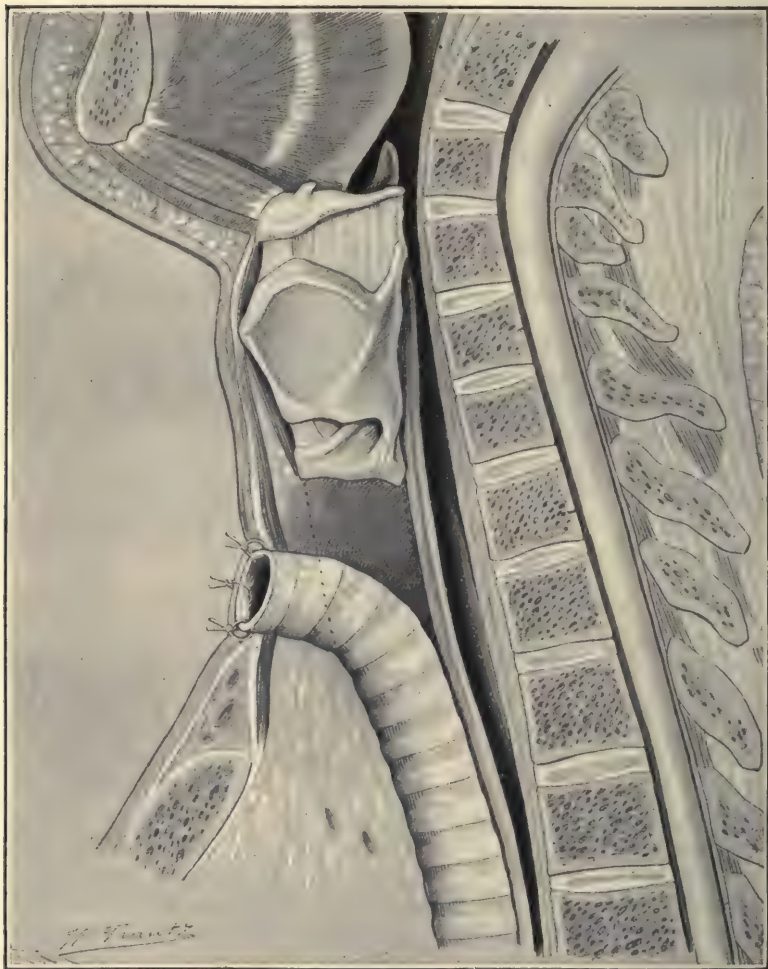


Fig. 332.—Laryngectomy.

Sagittal section of the neck: The trachea has been separated from the cricoid, drawn forwards, and sutured to the skin about 1 cm. above the sternum. (*Le Bec.*)

Indications.—Complete removal of the larynx is required in some cases of cancer of the larynx, and the indications for it have already been given (p. 534).

* F. G. Harvey, "Six Cases of Excision of the Larynx," *Lancet*, Sept. 21, 1901; and *Epitome in Journ. of Laryngol.*, xvii., 1902, No. 2, p. 103.

Operation.—Chloroform is generally employed, but the operation has been carried out under local anæsthesia. The preliminary steps are similar to those required for laryngo-fissure, and the operation is sometimes a continuation of that procedure in cases

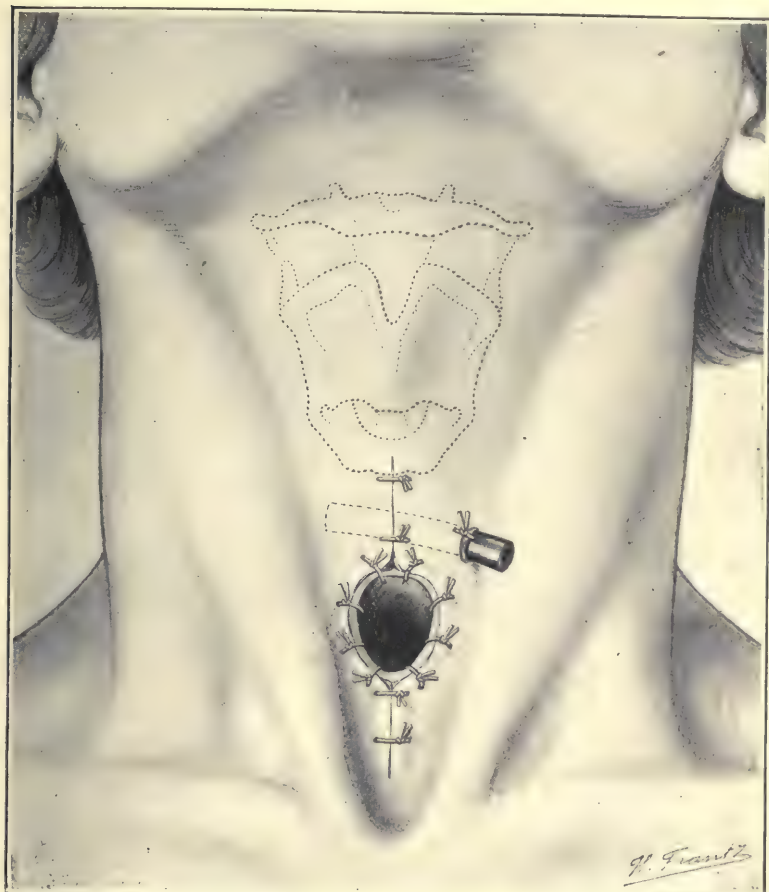


Fig. 333.—Laryngectomy.

The divided end of the trachea has been stitched to the skin. A drainage tube is inserted in the space above the curved trachea and below the lower opening of the larynx. (*Le Bec.*)

where the disease is found to have extended beyond the soft parts of the endolarynx. A vertical median incision is made from the centre of the hyoid bone to the sternal notch. At the upper extremity of this a transverse cut is made along the lower border of the hyoid bone. After the introduction of a tracheotomy tube, the windpipe

and larynx are carefully freed from tissue and muscles on each side round to the œsophagus. The trachea is raised from the œsophagus, cut through below the cricoid cartilage, and pulled forward so as to prevent any blood from entering its open end. Into this a

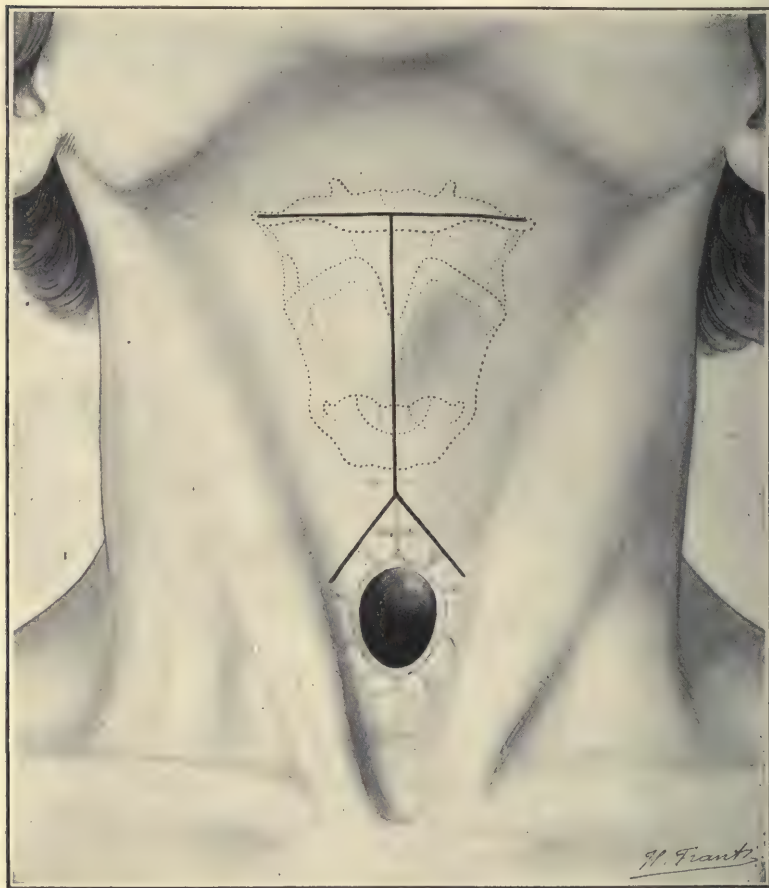


Fig. 334.—Laryngectomy.

Second operation : Shows the lines of incision in regard to the larynx and to the upper end of the trachea, now cicatrized to the front of the neck. (*Le Bec.*)

tampon cannula is inserted, and the anæsthesia is continued through it instead of the tracheotomy tube, which is now removed.

The larynx is tilted upwards and dissected from the œsophagus and pharyngeal constrictors ; the thyro-hyoid membrane is incised ; the ary-epiglottic folds are divided ; the tips of the thyroid cornua

are left behind ; and the larynx is removed. The opening left in the pharynx is closed as carefully as possible, the mucous surfaces being inverted and sutured together with catgut. Over this the walls of the pharynx are brought together and united with sutures

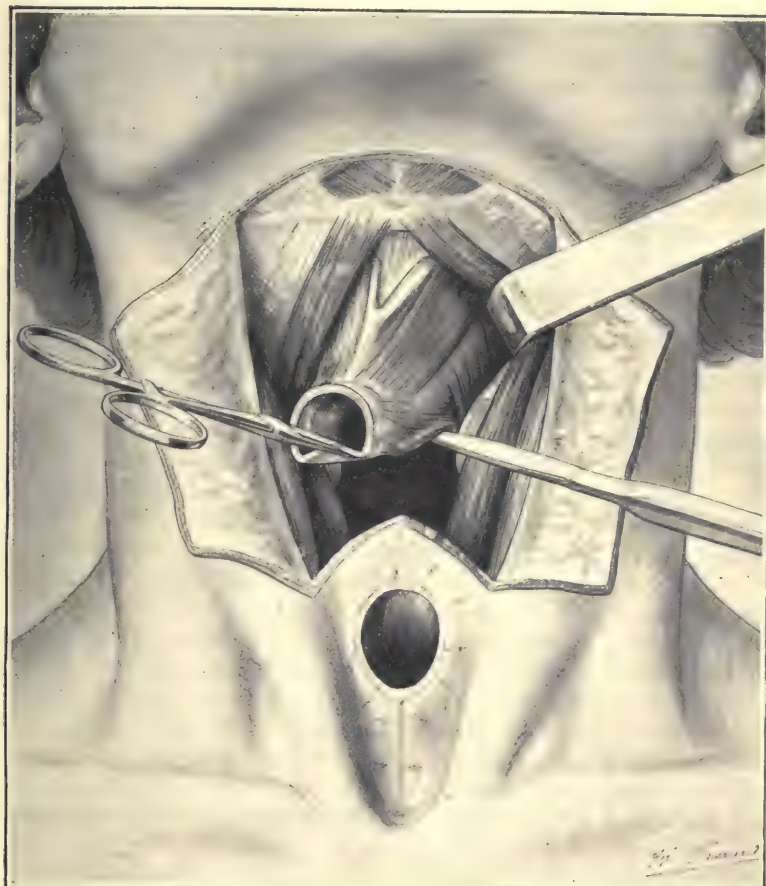


Fig. 335.—Laryngectomy.

Extirpation of the larynx : The orifice of the trachea has been fixed to the skin, and separated from the field of operation by a flap of skin and by its intact posterior wall. The larynx is now raised and separated from below upwards. The intact œsophagus is seen behind the trachea. (*J. C. Rec.*)

which do not penetrate the mucous membrane. Over this other layers of suture bring the fascia and muscles together so as to shut off the pharynx and build up a wall to resist the strain of swallowing. The external wound is closed down to the level of the severed

trachea, the end of which is stitched to the skin above the supra-sternal notch.

A tracheotomy tube is worn for a few days until the stump of the trachea becomes securely anchored; in cases where the orifice shows a tendency to retract, it is necessary to wear a short tube permanently. If a tracheotomy is done a few days beforehand, it accustoms the patient to breathing through the neck and helps to fix the trachea to the skin. Glands might be removed at this same operation, and the excision of the larynx left till a week later.

This method of excising the larynx, sometimes referred to as Périer's,* is apt to be long and trying, requiring as much as three hours. If a previous tracheotomy has been performed, it is sometimes difficult, owing to adhesions, to separate the trachea from the œsophagus. Another difficulty is that the denuded top rings of the trachea are apt to slough, allowing the windpipe to retract into the chest. In a modification by Le Bec † the trachea is cut across below the cricoid, tilted forwards, and carefully fixed to the skin at the lower end of the incision (Fig. 332, p. 794). Three weeks are allowed to elapse before attempting to remove the larynx. During this time mucus and septic secretions flow through the larynx to the space above the trachea, and this area is therefore carefully drained (Fig. 333, p. 795). When the trachea is firmly fixed, at the end of three weeks, the larynx is dissected up, preserving as much as is possible of the pharyngeal mucosa (Figs. 334, 335). Feeding is carried out through a nasal rubber stomach-tube which is kept in place for fourteen to twenty-one days.

Still better results have been obtained lately by greater care in technique,‡ by the use of local anæsthesia, and by Gluck's method of excising the larynx from above downwards.§

Results.—Since the general adoption of the plan of leaving no communication between the lungs and the pharynx, the danger of this operation has been greatly reduced. But the after-results are not always satisfactory. || The drawbacks have been described

* Périer, *Bull. de la Soc. de Chir.*, tome xvi., p. 239, séance du 19 Mars, 1890.

† *Ann. des Mal. de l'Oreille*, xxxi., 1905, p. 375; and *Paris Chirurg.*, Nov., 1910.

‡ G. W. Crile, *Laryngoscope*, xxii., 1912, No. 12, p. 1317.

§ R. Botey, *Ann. des Mal. de l'Oreille*, xl., 1914, No. 4, p. 348, and xxxix., 1913, No. 10, p. 308.

|| "Profound nervous depression and great fear of suffocation may follow it."
—R. C. Myles, *Journ. of Amer. Med. Assoc.*, March 5, 1898.

"If the operation succeeds, the patients lead such a feeble and painful existence that they might as well have succumbed to the original disease."
—Moure, *Soc. Franç. de Laryngol.*, Mai, 1898.

"Laryngectomy usually results in death within three years, even although recurrence may not have taken place."—Delavan, *N.Y. Med. Journ.*, Oct. 14, 1893.

at p. 533. Still, cases such as the well-known one of Solis-Cohen have survived for more than six years in comparative comfort, and I have known patients who enjoyed travelling and golfing. It is therefore our duty, in the few cases in which the operation offers a prospect of completely extirpating the disease, to place the possibilities before the patient and his friends and let them decide.

FORMULÆ

In the following prescriptions the quantities are given in both English and metric measures. In several instances the amount ordered is sufficient to make a compressed tablet—a convenient form in many cases for preparing fresh, warm lotions.

LOCAL ANÆSTHETICS

FORMULA 1

R	Cocainæ hydrochloridi	. gr. xlviii ad xcvi	. 3·2 to 6·4	gram.
	Acidi salicylici	. gr. $\frac{1}{2}$	. . .	0·032 gram.
	Aquam destillatam.	ad $\frac{3}{4}$ i	. . .	to 30·0 c.c.

The above 10–20 per cent. solution of cocaine is intended for the use of the surgeon himself, and should never be entrusted to the patient.

FORMULA 2

In the following prescription the addition of phenazone somewhat increases the anæsthetic action, while the thymol solution helps, like the salicylic acid in the previous formula, to preserve the solution.

R	Cocainæ hydrochloridi	. gr. x ad xx	. . .	0·65 to 1·37	gram.
	Phenazoni	. gr. xl	. . .	2·6	gram.
	Liquoris thymol alcoholici	℥ ii	. . .	0·12	c.c.
	Aquam destillatam	. ad $\frac{3}{4}$ i	. . .	to 30·0	c.c.

FORMULA 3

R	Cocainæ hydrochloridi	. gr. xv	. . .	1·0	gram.
	Menthol	. gr. xv	. . .	1·0	gram.
	Acidi carbolicæ puri	. gr. xv	. . .	1·0	gram.
	Liquoris adrenalin (1-1,000)	gr. $\frac{1}{8}$	. . .	0·001	gram.

(Bonain.)

This local anæsthetic mixture is chiefly of use in small operations on the outer ear. It is somewhat too caustic in the nose. But it is useful when applied to the tonsil or on a peritonsillar abscess before puncturing.

FORMULA 4

R	Orthoformi	. . . gr. xv	. . .	1·0	gram.
	Iodoformi	. . . gr. xv	. . .	1·0	gram.
	Menthol	. . . gr. iii	. . .	0·2	gram.

Insufflation in dysphagia. A few grains for a dose.

FORMULÆ

801

FORMULA 5

R	Cocainæ hydrochloridi	.	gr. ix	.	.	.	0·6	gram.
	Morphinæ hydrochloridi	.	gr. iss	.	.	.	0·1	gram.
	Menthol	.	gr. xv	.	.	.	1·0	gram.
	Iodoformi	.	℥ii	.	.	.	8·0	gram.
	Acidi borici	.	℥ii	.	.	.	8·0	gram.

Insufflation in dysphagia. A few grains for a dose.

FORMULA 6

Insufflation of morphia to relieve the dysphagia of tuberculous laryngitis:—

R	Morphinæ hydrochloridi	.	gr. $\frac{1}{4}$ ad $\frac{1}{2}$	.	.	.	0·016 to 0·032	gram.
	Sacchari lactis	.	gr. $\frac{1}{4}$ ad $\frac{1}{2}$	.	.	.	0·016 to 0·032	gram.
	Acaciæ gummi	.	gr. i	.	.	.	0·06	gram.

The larynx should first be cleansed with an alkaline spray, and if the powder is properly insufflated during the forenoon the patient is often enabled to eat both his mid-day and his evening meal in comparative ease. If the practitioner is not experienced in laryngeal manipulation, he can frequently succeed in lodging the powder in the larynx if he gently passes his left forefinger backwards until it touches the tip of the epiglottis: he has then only to guide the insufflator along his finger until he feels the end of the instrument is over the laryngeal cavity, when he should blow in the powder as the patient sounds a long E.

FORMULA 7

R	Novocainæ	.	.	.	.	.	0·1	gram.
	Suprarenin boratis	.	.	.	.	.	0·00045	gram.
	Sodii chloridi	.	.	.	.	.	0·045	gram.
	Aquæ destillatæ	.	.	.	.	.	5·0	c.c.

This is sold in an ampoule. It is a 2 per cent. solution of novocain with suprarenin, suitable for endermic or submucous injections.

The question of local anæsthesia and the manner of employing it are described on p. 71.

NASAL WASHES (COLLUNARIA)

Directions as to temperature, method of use, etc., are given on p. 56.

FORMULA 8

R	Sodii bicarbonatis	.	gr. v	.	.	.	0·32	gram.
	Sodii biboratis	.	gr. v	.	.	.	0·32	gram.
	Sodii chloridi	.	gr. v	.	.	.	0·32	gram.
	Sacchari albi	.	gr. v	.	.	.	0·32	gram.

To be dissolved in 3 or 4 oz. of warm water, or the drugs can be ordered in compressed tablets.

This is one of the blandest and most useful alkaline washes for cleansing the nose and throat.

FORMULÆ

FORMULA 9

Compound Nasal and Carbolic

R Sodii bicarbonatis . . .	gr. iii . . .	0·2 grm.
Sodii biboratis . . .	gr. iii . . .	0·2 grm.
Acidi carbolici . . .	gr. i . . .	0·06 grm.
Sacchari albi . . .	gr. v . . .	0·32 grm.

Water to 3 or 4 oz., or the above quantity of drugs can be dispensed in a compressed tablet.

The carbolic renders the nose wash a little more soothing and antiseptic. It should not be ordered in chronic cases, for fear of injuring the sense of smell.

FORMULA 10

Such antiseptics as sanitas fluid, listerine, etc., may be added to any of the above alkaline lotions. Several alkaline and compound antiseptic fluids are sold in concentrated form, of which the following are good specimens:—

R Sodii bicarbonatis . . .	gr. viii . . .	0·52 grm.
Sodii biboratis . . .	gr. iv . . .	0·26 grm.
Sodii chloridi . . .	gr. viii . . .	0·52 grm.
Sodii sulphatis . . .	gr. iii . . .	0·2 grm.
Sodii phosphatis . . .	gr. i . . .	0·06 grm.
Menthol . . .	gr. $\frac{1}{2}$. . .	0·032 grm.
Thymol . . .	gr. $\frac{1}{4}$. . .	0·016 grm.
Eucalyptol . . .	$\mathbb{M}\frac{1}{2}$. . .	0·008 c.c.
Olei pini pumilionis . . .	$\mathbb{M}\frac{1}{8}$. . .	0·008 c.c.
Glycerini . . .	$\mathbb{M}lx$. . .	3·5 c.c.
Chloretone . . .	gr. $\frac{1}{4}$. . .	0·016 grm.
Aquam destillatam . . .	ad $\mathbb{Z}i$. . .	to 30·0 c.c.

One part in 3 to 6 of warm water.

FORMULA 11

R Sodii bicarbonatis . . .	$\mathbb{Z}ii$. . .	8·0 grm.
Sodii biboratis . . .	$\mathbb{Z}ii$. . .	8·0 grm.
Listerine . . .	$\mathbb{Z}i$. . .	30·0 c.c.
Glycerini . . .	$\mathbb{Z}iv$. . .	115·0 c.c.

A teaspoonful in 2 fluid oz. (60·0 c.c.) of water as a nose lotion.

FORMULA 12

The following is the formula of a nose lotion for obstinate cases of tertiary syphilis:—

R Hydrargyri perchloridi . . .	$\mathbb{Z}ss$. . .	2·0 grm.
Alcoholis . . .	$\mathbb{Z}iiiss$. . .	100·0 grm.

For use, add $\mathbb{Z}i$ (3·5 c.c.) to 1 quart (practically 1 litre) of tepid salt-and-water.

The above concentrated solution is highly poisonous.

INHALATIONS (VAPORES)

In the following formulæ the quantities given are generally prescribed for 1 oz., of which a teaspoonful (60 drops) is added to a pint jug of steaming water at 130° to 140° F. (54·4° to 60·0° C.). A cone

made out of a folded handkerchief is placed over the mouth of the vessel, and through this the patient inhales the vapour. If the inhalation is only intended for the nose, the steam is drawn up and down the nostrils. If for the larynx, deep inspirations should be made through the nose and mouth. About four to eight minutes are occupied over each inhalation, which is repeated hourly, or less often, as the case demands. It is not advisable to go out of doors for half an hour afterwards.

Special inhalers may also be employed.

The essential oils must be prescribed with light carbonate of magnesia to hold them in suspension; but nowadays these oils are more conveniently given in oily sprays (*see* Formulæ 66 to 70), or used as dry inhalations.

FORMULA 13

R Tincturæ benzoini compositæ . . . \mathfrak{z} i . . . 30·0 c.c.

The well-known "Friar's balsam" is a useful sedative. It can be rendered more soothing by the addition of 1 drachm of chloroform.

FORMULA 14

R Menthol . . . gr. x . . . 0·65 grm.
Tincturæ eucalypti (vel Spiritus vini rectificati) \mathfrak{z} i . . . 30·0 c.c.

A teaspoonful in a pint of steaming water: inhale the vapour as directed.

A valuable sedative and antiseptic in acute inflammations of the nose and accessory sinuses. But menthol preparations are not suitable for children under 3 years of age.

FORMULA 14a

R Eucalyptol . . . \mathfrak{z} i . . . 4·0 grm.
Menthol . . . gr. xxx . . . 2·0 grm.
Tincture of benzoin . . . \mathfrak{z} ii . . . 60·0 grm.

To be used as the preceding.

FORMULA 15

R Olei pini sylvestris . . . \mathfrak{z} ii . . . 7·0 c.c.
Tincturæ benzoini compositæ . . . \mathfrak{z} i . . . 30·0 c.c.
Magnesii carbonatis levis \mathfrak{z} i . . . 4·0 grm.
Aquæ rosæ . . . \mathfrak{z} i . . . 30·0 c.c.
Glycerinum . . . ad \mathfrak{z} iii . . . to 90·0 c.c.

\mathfrak{z} ss (15 c.c.) to each pint of water in the inhaler.

FORMULA 16

R Acidi carbolici . . . gr. lx . . . 4·0 grm.
Ammonii chloridi . . . gr. lx . . . 4·0 grm.
Spiritus vini rectificati . . . \mathfrak{z} iii . . . 10·5 c.c.
Aquæ destillatæ . . . \mathfrak{z} iii . . . 10·5 c.c.

A few drops in steaming water, as an inhalation in acute catarrh.

FORMULÆ

FORMULA 17

℞ Spiritus camphoræ . . . ℥i . . . 30·0 c.c.
 Half a teaspoonful to a pint of steaming water. In acute catarrh.

FORMULA 18

℞ Creosoti . . . ℥lxxx . . . 4·7 c.c.
 Cretæ gallicæ . . . gr. xx . . . 1·3 grm.
 Aquam . . . ad ℥i . . . to 30·0 c.c.
 Stimulant and antiseptic.

DRY INHALATIONS (VAPORES SICCI)

Any of the volatile oils can be used as dry inhalations. Menthol and camphor can be inhaled from the solid crystals.

Many of them can be prescribed with alcohol, and inhaled from a Burney Yeo inhaler (Fig. 336).



Fig. 336.—Burney Yeo's inhaler.

FORMULA 19

℞ Chloroformi . . . } āā ℥ss . . . 15 c.c.
 Spiritus vini rectificati . }

Twenty to 60 drops are sprinkled on a handkerchief, and inhaled for spasmodic laryngitis, paroxysmal coryza, etc. Not more than 3 teaspoonfuls to be used on any single occasion, except in the presence of a medical man.

FORMULA 20

℞ Menthol . . . gr. xv . . . 1·0 grm.
 Chloroformi . . . ℥ss . . . 15·0 c.c.

A few drops can be inhaled in spasmodic rhinitis.

FORMULA 21

℞ Creosoti . . . }
 Spiritus chloroformi . . . } partes æquales
 Spiritus vini rectificati . . . }

A few drops on the sponge of an inhaler.

FORMULA 22

R	Acidi carbolici	.	.	℥ii	.	.	.	8·0	gram.
	Creosoti	.	.	℥ii	.	.	.	7·0	c.c.
	Tincturæ iodi	.	.	℥i	.	.	.	3·5	c.c.
	Spiritus ætheris	.	.	℥i	.	.	.	3·5	c.c.
	Spiritus chloroformi	.	.	℥ii	.	.	.	7·0	c.c.

Six to 8 drops on the inhaler every hour.*

INSUFFLATIONS

Some of the following powders can be used as snuff, but the indications for nasal insufflations are limited. Antiseptic powders—iodoform, iodol, europhen, formidine, etc.—are chiefly used in affections of the pharynx and larynx.

The directions for laryngeal insufflation are given on p. 65.

FORMULA 23

R	Iodoformi	.	.	.	gr. i	.	.	.	0·065	gram.
	Pulveris amyli	.	.	.	gr. ½	.	.	.	0·032	gram.

Antiseptic.

FORMULA 24

R	Orthoformi	.	.	.	gr. v	.	.	.	0·32	gram.
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Analgesic.

FORMULA 25

R	Orthoformi	} partes æquales
	Iodoformi	

Analgesic and antiseptic.

For anæsthetic insufflations, *see* Nos. 4 to 6.

FORMULA 26

R	Iodoformi	} partes æquales
	Acaciæ gummi	.	.	.	.	.	.	.
	Essentiæ menthæ piperitæ,	q.s.							

Insufflation in the ulceration of tuberculosis, malignant disease, or syphilis of the larynx.

FORMULA 27

R	Hydrargyri subchloridi	.	.	gr. cl	.	.	.	10·0	gram.
	Aluminis	.	.	gr. xlv	.	.	.	3·0	gram.

In severe nasal syphilis; 1 to 4 gr. for a dose.

GARGLES, THROAT WASHES, AND SPRAYS

The method of employing these is described on p. 60. The nose lotions—Nos. 8 to 11—are also suitable for use in the pharynx or larynx.

FORMULA 28

R	Sodii benzoatis	.	.	℥ii	.	.	.	8·0	gram.
	Resorcini	.	.	℥iiss	.	.	.	6·0	gram.
	Phenazoni	.	.	℥i	.	.	.	4·0	gram.
	Glycerinum	.	.	ad ⅔ viiii	.	.	.	to 230·0	c.c.

A teaspoonful in half a tumblerful of tepid water.

An alkaline, antiseptic, and soothing gargle.

* David R. Lees, "Incipient Pulmonary Tuberculosis," *Brit. Med. Journ.*, Dec. 11, 1909, p. 1695.

FORMULÆ

FORMULA 29

R	Acidi salicylici	.	.	℥i	.	.	4.0	grm.
	Sodii chloridi	.	.	℥x	.	.	40.0	grm.
	Sodii bicarbonatis	.	.	℥iiss	.	.	75.0	grm.

Half a teaspoonful in a small tumblerful of tepid water.

A useful lotion for syringing or gargling the throat in tonsillar affections. (Lermoyez.)

FORMULA 30

R	Salol	.	.	gr. xc	.	.	6.0	grm.
	Tincturæ myrrhæ	.	.	℥vi	.	.	21.0	c.c.
	Spiritus vini rectificati	ad	℥iii	.	.	.	to 90.0	c.c.

One teaspoonful in $\frac{1}{2}$ pint of water, for a gargle.

FORMULA 31

R	Acidi carbolici	.	.	gr. iiss	.	.	0.16	grm.
	Morphinæ hydrochloridi	.	.	gr. i ad ii	.	.	0.06 to 0.13	grm.
	Cocainæ hydrochloridi	.	.	gr. ii ad iv	.	.	0.13 to 0.26	grm.
	Menthol	.	.	gr. iv	.	.	0.26	grm.
	Glycerini	.	.	℥iiss	.	.	13.5	c.c.
	Aquam destillatam	.	.	ad ℥iv	.	.	to 115.0	c.c.

Use as a spray, three or four times a day before food. Use an alkaline mouth-wash after spraying, so as not to carry the anæsthetic drug into the stomach.

Antiseptic and alkaline spray in painful affections of pharynx and larynx (tubercle, cancer). (E. J. Moure.)

FORMULA 32

R	Acidi carbolici	.	.	gr. l	.	.	3.2	grm.
	Sodii biboratis	.	.	gr. lx	.	.	4.0	grm.
	Potassii bromidi	.	.	gr. lx	.	.	4.0	grm.
	Spiritus menthæ piperitæ	.	.	℥ss	.	.	15.0	c.c.
	Glycerinum	.	.	ad ℥iv	.	.	to 115.0	c.c.

A teaspoonful in half a tumblerful of tepid water.

Cleansing and soothing gargle, useful after evacuating peritonsillar abscess.

FORMULA 33

R	Aluminis	.	.	gr. lx	.	.	4.0	grm.
	Acidi tannici	.	.	gr. lxxx	.	.	5.3	grm.
	Aquam destillatam	ad	℥x	.	.	.	to 280.0	c.c.

Astringent.

FORMULA 34

R	Boracis	.	.	℥ii	.	.	8.0	grm.
	Glycerini	.	.	℥ii	.	.	7.5	c.c.
	Tincturæ myrrhæ	.	.	℥ii	.	.	7.5	c.c.
	Aquam destillatam	ad	℥vi	.	.	.	to 170.0	c.c.

Mild alkaline and astringent.

FORMULA 35

R	Potassii chloratis	.	.	gr. lxxx	.	.	5.0	grm.
	Lotionis nigræ (B.P.)	.	.	℥viii	.	.	230.0	c.c.

To be mixed with an equal quantity of tepid water before use.

In syphilis.

FORMULA 36

R Hydrargyri perchloridi	. gr. $1\frac{3}{4}$	. . .	. 0.11	gram.
Sodii salicylatis	. gr. $3\frac{3}{4}$	. . .	. 0.25	gram.
Aquam destillatam	ad $\frac{3}{4}$ iv	. . .	to 115.0	c.c.

Thirty to 60 drops in a wineglass of water, as a gargle in syphilis. (As this is a concentrated solution, the bottle should be carefully labelled.)

FORMULA 37

R Acidi carbolici	. $\frac{3}{4}$ x gr. xl	. . .	. 40.0	gram.
Sodii bicarbonatis	. $\frac{3}{4}$ ss	. . .	. 2.0	gram.
Glycerini	. $\frac{3}{4}$ xiii Mxx	. . .	. 50.0	c.c.
Aquam Coloniensis	ad $\frac{3}{4}$ iv	Eau de Cologne	to 115.0	c.c.

One teaspoonful in half a tumblerful of water, as a gargle.

FORMULA 38

R Liquoris sodæ chlorinatæ	$\frac{3}{4}$ iiss	. . .	. 10.0	c.c.
Aquam destillatam.	ad $\frac{3}{4}$ vi	. . .	to 170.0	c.c.

Disinfectant lotion in septic pharyngitis.

LINCTUS (COUGH MIXTURES)

The usual dose is one teaspoonful, sipped and swallowed slowly. The physician should indicate the number of doses which may be taken in twenty-four hours—generally four to eight.

FORMULA 39

R Glycerini	. $\frac{3}{4}$ ss	. . .	. 15.0	c.c.
Syrupi limonis	. $\frac{3}{4}$ ss	. . .	. 15.0	c.c.
Aquam destillatam.	ad $\frac{3}{4}$ ii	. . .	to 60.0	c.c.

A teaspoonful occasionally.

This is a useful basis, to which cherry-laurel water, syrup of codeia in doses of $\frac{3}{4}$ ss (1.8 c.c.) to $\frac{3}{4}$ i (3.5 c.c.), or liquor morphinæ hydrochloridi Mv (0.3 c.c.) to Mxx (1.2 c.c.) can be added.

FORMULA 40

R Tincturæ camphoræ compositæ	. $\frac{3}{4}$ ii	. . .	. 7.0	c.c.
Oxymel scillæ	. $\frac{3}{4}$ ii	. . .	. 7.0	c.c.
Syrupi tolutani	. $\frac{3}{4}$ ii	. . .	. 7.0	c.c.
Glycerini	. $\frac{3}{4}$ ii	. . .	. 7.0	c.c.

Dose, 1 teaspoonful.

FORMULA 41

R Acidi hydrocyanici diluti.	Mxxx	. . .	. 1.8	c.c.
Glycerini	. $\frac{3}{4}$ ii	. . .	. 7.0	c.c.
Oxymel scillæ	. $\frac{3}{4}$ ii	. . .	. 7.0	c.c.
Syrupi limonis	. $\frac{3}{4}$ ii	. . .	. 7.0	c.c.
Aquam destillatam.	ad $\frac{3}{4}$ i	. . .	to 30.0	c.c.

Liquor morphinæ acetatis Mxl (2.4 c.c.) may be added.

Dose, 1 teaspoonful.

LOZENGES AND PASTILLES

Many lozenges are too large and too sweet, while others take too long to dissolve in the mouth. It is inadvisable to order lozenges which are very disagreeable in taste, or apt to upset the stomach. The larger lozenges, in some cases, can be broken up and used in fragments. A basis of "glyco-gelatin" or "fruit paste" is most suitable in those cases where immediate local effect is desired. Many lozenges can be prepared in the form of compressed tablets. The benzoic acid, carbolic acid, tannin, catechu, krameria, guaiacum, and orthoform lozenges of the Throat Hospital Pharmacopœia are all useful.

Borax, chloride of ammonium, chlorate of potash, and bromide of potassium are best ordered in the form of compressed tablets.

Morphine and codeine can be ordered in the preparations of the British Pharmacopœia.

FORMULA 42

R	Menthol	.	.	.	gr. $\frac{1}{8}$	.	.	.	0.008 gm.
	Extracti glycyrrhizæ	.	.	.	gr. ii	.	.	.	0.13 gm.

A useful sedative lozenge, of small bulk.

FORMULA 43

R	Menthol	.	.	.	gr. $\frac{1}{20}$	.	.	.	0.0032 gm.
	Acidi carbolici	.	.	.	gr. $\frac{1}{4}$	.	.	.	0.016 gm.

Useful local sedative.

FORMULA 44

R	Acidi carbolici	.	.	.	gr. $\frac{1}{4}$	.	.	.	0.016 gm.
	Olei cinnamomi	.	.	.	℥ $\frac{1}{20}$	.	.	.	0.0032 gm.

FORMULA 45

R Trochisci glycyrrhizæ et anisi.

A harmless and helpful lozenge in the Pharmacopœia of the Brompton Hospital.

FORMULA 46

R	Formalin	.	.	.	gr. $\frac{1}{8}$.	.	.	0.008 gm.
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A loose chemical combination of formic aldehyde and lactose is made up into tablets and sold under various trade names, and they appear to be satisfactory, non-toxic, and trustworthy local antiseptics.

MIXTURES

FORMULA 47

R	Morphinæ	.	.	.	gr. $\frac{1}{4}$ ad $\frac{1}{2}$	.	.	.	0.016 to 0.02 gm.
	Spiritus ætheris nitratis	.	.	.	℥i	.	.	.	3.5 c.c.
	Liquoris ammonii acetatis	.	.	.	℥iii	.	.	.	10.5 c.c.
	Aquæ camphoræ	.	.	.	℥iss	.	.	.	45.0 c.c.

The draught at bedtime.

In the initial stage of acute rhinitis.*

* Burney Yeo, *Practitioner*, May, 1907.

FORMULA 48

R Sodii salicylatis . . .	gr. x ad xx . . .	0·65 to 1·30	gram.
Phenazoni . . .	gr. v . . .	0·32	gram.
Spiritus ammoniæ aromatici	℥xv . . .	0·9	c.c.
Elixir rubri . . .	℥xv ad ℥l . . .	0·9 c.c. to 3·0	c.c.
Aquam cinnamomi . . .	ad ℥i . . .	to 30·0	c.c.

In early stages of influenza, catarrh, and painful pharyngeal affections.

FORMULA 49

R Potassii nitratis . . .	gr. i . . .	0·06	gram.
Spiritus ætheris nitrosi . . .	℥iv . . .	0·24	c.c.
Liquoris ammonii acetatis	℥xv . . .	0·9	c.c.
Aceti scillæ . . .	℥iii . . .	0·18	c.c.
Decoctum scoparii . . .	ad ℥i . . .	to 3·5	c.c.

Laryngitis of children.

FORMULA 50

R Vini ipecacuanhæ . . .	℥iiss . . .	0·15	c.c.
Tincturæ scillæ . . .	℥iiss . . .	0·15	c.c.
Spiritus ammoniæ aromatici	℥ii . . .	0·12	c.c.
Glycerini . . .	℥v . . .	0·3	c.c.
Aquam destillatam . . .	ad ℥i . . .	to 3·5	c.c.

Laryngitis of children.

FORMULA 51

R Vini antimonialis . . .	℥ii . . .	7·0	c.c.
Apomorphinæ hydrochloridi	gr. ss . . .	0·032	gram.
Codeinæ sulphatis . . .	gr. iiss . . .	0·162	gram.
Liquoris ammonii acetatis	℥iiss . . .	45·0	c.c.
Syrupus pruni virginianæ	ad ℥iii . . .	to 90·0	c.c.

One teaspoonful (3·5 c.c.) every two hours.

Aconite can be added if the patient is feverish, or vinum ipecacuanhæ prescribed instead of vinum antimoniale.

Acute laryngitis, first stage.

FORMULA 52

R Vini antimonialis . . .	āā ℥x . . .	0·6	c.c.
Vini ipecacuanhæ . . .	℥xxx . . .	1·8	c.c.
Spiritus ætheris nitrosi . . .	℥ii . . .	7·0	c.c.
Liquoris ammonii acetatis	℥i . . .	3·5	c.c.
Syrupi limonis . . .	ad ℥i . . .	to 30·0	c.c.
Misturam amygdalæ . . .	℥ss every four hours.		

℥ss every four hours.

In laryngitis and general catarrh. To promote secretion.

FORMULA 53

R Tincturæ aconiti . . .	℥ii ad v . . .	0·12 to 0·3	c.c.
Potassii chloratis . . .	gr. x . . .	0·65	gram.
Liquoris ferri perchloridi.	℥xx . . .	1·2	c.c.
Liquoris hydrargyri per-			
chloridi . . .	℥x . . .	0·6	c.c.
Liquoris strychninæ . . .	℥v . . .	0·3	c.c.
Glycerini . . .	℥ii . . .	7·0	c.c.
Aquam chloroformi . . .	ad ℥ss . . .	to 15·0	c.c.

Every four hours; or ℥ii (= 7 c.c.) every two hours.

Septic tonsillitis.

FORMULÆ

FORMULA 54

R	Heroin hydrochloridi	gr. $\frac{1}{8}$	.	.	.	0.01	gram.
	Acidi hydrocyanici diluti		.	.	.		
	(B.P.)	℥viii	.	.	.	0.5	c.c.
	Aquam chloroformi	ad ℥ii	.	.	.	to 60.0	c.c.

A tablespoonful every hour until relieved.

Irritating cough of laryngitis.*

FORMULA 55

R	Potassii citratis	gr. xv	.	.	.	1.0	gram.
	Liquoris ammonii acetatis	℥ii	.	.	.	7.0	c.c.
	Tincturæ scillæ	℥xii	.	.	.	0.7	c.c.
	Vini ipecacuanhæ	℥x	.	.	.	0.6	c.c.
	Aquam anisi	ad ℥i	.	.	.	to 30.0	c.c.

Cough at night, especially of emphysematous and chronic bronchitic character.

FORMULA 56

R	Bismuthi carbonatis	gr. x	.	.	.	0.65	gram.
	Magnesii carbonatis	gr. xv	.	.	.	1.0	gram.
	Acidi hydrocyanici diluti	℥iv	.	.	.	0.24	c.c.
	Liquoris potassæ	℥x	.	.	.	0.6	c.c.
	Pulveris tragacanthæ compositi	gr. v	.	.	.	0.32	gram.
	Aquam menthæ piperitæ	ad ℥i	.	.	.	to 30.0	c.c.

To be taken half an hour before food.

In pharyngeal affections associated with digestive troubles.

FORMULA 57

R	Pulveris rhei	gr. v	.	.	.	0.32	gram.
	Ammonii carbonatis	gr. v	.	.	.	0.32	gram.
	Infusi quassie	℥ss	.	.	.	15.0	c.c.
	Aquam menthæ piperitæ	ad ℥i	.	.	.	to 30.0	c.c.

To be taken before meals.

In dyspeptic conditions with pharyngeal symptoms.

FORMULA 58

R	Ferri et ammonii citratis	gr. v ad xv	.	.	.	0.32 to 1.0	gram.
	Liquoris arsenicalis	℥iv	.	.	.	0.24	c.c.
	Infusum quassie	ad ℥i	.	.	.	to 30.0	c.c.

FORMULA 59

R	Sodii salicylatis	℥iv	.	.	.	16.0	gram.
	Tincturæ ferri perchloridi	℥iv	.	.	.	15.0	c.c.
	Acidi citrici	gr. x	.	.	.	0.65	gram.
	Glycerini	℥iss	.	.	.	45.0	c.c.
	Olei gaultheriæ	℥viii	.	.	.	0.5	c.c.
	Liquor ammonii citratis	ad ℥iv	.	.	.	to 115.0	c.c.

Dose, 1 to 2 teaspoonfuls.

Acute tonsillitis in anæmic subjects.

*. A. Bousfield, *Practitioner*, May, 1907.

FORMULA 60

R Potassii iodidi . . .	gr. xv . . .	1.0 grm.
Ammonii carbonatis . . .	gr. v . . .	0.32 grm.
Ferri et ammonii citratis . . .	gr. x . . .	0.65 grm.
Spiritus chloroformi . . .	℥x . . .	0.65 c.c.
Aquam destillatam . . .	ad ℥i . . .	to 30.0 c.c.

Iodide of potassium in a tonic mixture.

FORMULA 61

R Potassii iodidi . . .	gr. v ad xxx . . .	0.32 to 2.0 grm.
Liquoris hydrargyri per-chloridi . . .	℥ss . . .	1.87 c.c.
Ammonii carbonatis . . .	gr. ii . . .	0.13 grm.
Tincturæ nucis vomicæ . . .	℥iii . . .	0.18 c.c.
Decoctum sarsæ composi-tum . . .	ad ℥i . . .	to 30.0 c.c.

Iodide of potassium, with mercury and tonics.

FORMULA 62

R Liquoris atropinæ sulphatis . . .	℥½ . . .	0.03 c.c.
Liquoris strychninæ . . .	℥v . . .	0.3 c.c.
Syrupi aurantii . . .	℥i . . .	3.5 c.c.
Aquam destillatam . . .	ad ℥ss . . .	to 15.0 c.c.

A tablespoonful after breakfast, for ten days, and, if well tolerated, one after breakfast and one after lunch for a second period of ten days.

Useful in spasmodic rhinitis and hay fever.

FORMULA 63

R Zinci phosphidi . . .	gr. ⅞ . . .	0.004 grm.
Quininæ sulphatis . . .	gr. ii . . .	0.13 grm.
Extracti nucis vomicæ . . .	gr. ¼ . . .	0.016 grm.

This pill before meals, and Donovan's solution ℥iii to v (0.18 to 0.3 c.c.) after meals. (J. N. Mackenzie.)

In hay-fever and other reflex neuroses of the nose.

FORMULA 64

Compound Asthma Powder

R Potassii nitratis . . .	} āā gr. ccxl . . .	16.0 grm.
Aquæ destillatæ . . .		
Pulveris lobeliæ . . .		
Pulveris foliorum stramonii . . .		
Pulveris theæ nigrae . . .	℥i . . .	0.06 c.c.
Olei anisi . . .		

The fumes of half a teaspoonful or more to be inhaled six or eight times a day, and the bedroom fumigated with same.

NEBULÆ (SPRAY SOLUTIONS)

AQUEOUS SOLUTIONS

The prescriptions given for collunaria (Nos. 8 to 11) can all be used as sprays for the nose, pharynx, and larynx. Those given as gargles (Nos. 28, 29, and 31) can be used as pharyngeal and laryngeal sprays, and many can also be used for spraying the nose.

FORMULÆ

FORMULA 65

The following is given as the basis of a well-known proprietary article, used in a fine nebulizer for asthma and hay-fever:—

Atropinæ sulphatis . . .	gr. ss . . .	0·032 grm.
Sodii nitritis . . .	gr. ix . . .	0·6 grm.
Glycerini . . .	$\frac{3}{4}$ i . . .	3·5 c.c.
Aquam destillatam . . .	ad $\frac{3}{4}$ ss . . .	to 15·0 c.c.

OILY SOLUTIONS

The oily solutions that follow are intended for the nose or throat. In many cases the spray is directed through the nose, and inhaled into the larynx and trachea. They require a special spray, often called an atomizer. When required in a form to reach the bronchi and lungs, these oily liquids must be used in a nebulizer.

They may also in many cases be employed with advantage as paints, being applied to the parts by means of cotton-wool mops or small camel's-hair pencils.

Liquid paraffin and the hydrocarbon oils, known under various trade names, can be used unmedicated or as a basis for various drugs.

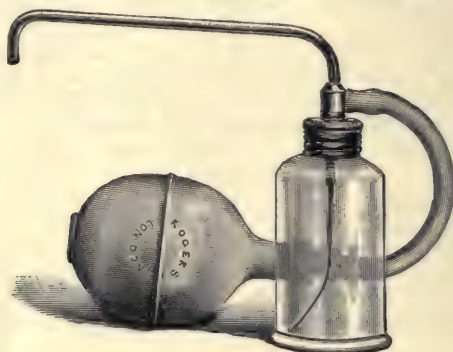


Fig. 337.—Laryngeal “aqualic” atomizer.

FORMULA 66

R Menthol . . .	gr. v ad xxx . . .	0·32 to 2·0 grm.
Paraffinum liquidum (B.P.) . . .	ad $\frac{3}{4}$ i . . .	to 30·0 c.c.

Useful as an emollient, anæsthetic, and antiseptic.

FORMULA 67

R *Camphor-menthol . . .	gr. v ad x . . .	0·32 to 0·64 grm.
Paraffini liquidi benzoinati $\frac{1}{2}$ i . . .		30·0 c.c.

In coryza, hay-fever, intumescent rhinitis, hypertrophic rhinitis, pharyngitis, acute laryngitis, tracheitis, bronchitis.

Or a few drops of camphor-menthol can be added to hot water and the steam inhaled.

* Equal parts by weight of camphor and menthol rubbed together until liquefied.

FORMULA 68

R	Thymol	.	.	gr. i	.	.	0.065	gram.
	Menthol	.	.	gr. x	.	.	0.65	gram.
	Eucalyptol	.	.	℥i	.	.	0.065	c.c.
	Paraffini liquidi	.	.	℥i	.	.	30.0	c.c.

For painting or spraying on atrophic surfaces.

FORMULA 69

R	Chloretone	.	.	gr. xv	.	.	1.0	gram.
	Camphoræ	.	.	gr. xl	.	.	2.5	gram.
	Menthol	.	.	gr. xl	.	.	2.5	gram.
	Olei cinnamomi	.	.	℥viii	.	.	0.5	c.c.
	Paraffini liquidi	.	.	℥iii	.	.	93.5	c.c.

Antiseptic and sedative inhalant.

FORMULA 70

R	Unguenti hydrargyri nitratis	gr. xl	.	.	2.6	gram.
	Olei amygdalæ	℥ss	.	.	15.0	c.c.
	Olei olivæ	℥ss	.	.	15.0	c.c.

Mercurial and antiseptic.

PIGMENTA (SOLUTIONS FOR LOCAL APPLICATION)

The various caustic paints have been referred to in the text, and their method of application is described on p. 69.

FORMULA 71

Pigmentum Mandl (Iodine Paint)

R	Iodi puri	.	.	gr. vi	.	.	0.4	gram.
	Potassii iodidi	.	.	gr. xx	.	.	1.3	gram.
	Olei menthæ piperitæ	.	.	℥v	.	.	0.3	c.c.
	Glycerini	.	.	℥i	.	.	30.0	c.c.

This is a favourite stimulant and antiseptic paint. The strength of the iodine can be increased.

FORMULA 72

R	Resorcini	.	.	gr. v	.	.	0.32	gram.
	Glycerinum boracis.	ad	℥i	.	.	to	30.0	c.c.

Antiseptic.

FORMULA 73

R	Resorcini	.	.	℥i	.	.	4.0	gram.
	Spiritus menthæ piperitæ	.	.	℥xxv	.	.	1.5	c.c.
	Glycerinum	.	.	ad ℥i	.	.	to 30.0	c.c.

For painting the tonsils to reduce congestion before removal.

UNGUENTA (OINTMENTS)

FORMULA 74

R	Menthol	.	.	gr. i	.	.	0.065	gram.
	Acidi borici	.	.	gr. v	.	.	0.32	gram.
	Olei gaultheriæ	.	.	℥i	.	.	0.065	c.c.
	Lanolini	.	.	℥ii	.	.	8.0	gram.
	Vaselini	.	.	℥vi	.	.	23.0	gram.

A pleasant sedative and antiseptic; very useful after nasal operations.

FORMULÆ

FORMULA 75

℞ Unguenti hydrargyri nitratis
 diluti $\frac{3}{i}$ 4·0 grm.
 Vaselinum ad $\frac{3}{i}$ to 30·0 grm.

Weak mercurial ointment.

FORMULA 76

℞ Unguenti hydrargyri nitratis
 diluti gr. xx 1·3 grm.
 Pulveris zinci oxidi gr. xl 2·6 grm.
 Lanolini } āā ad $\frac{3}{i}$ to 30·0 grm.
 Vasellini }

Useful in fissures and other affections of the vestibules of the nose.

FORMULA 77

℞ Menthol gr. xx 1·3 grm.
 Acidi carbolici ℥x 0·6 c.c.
 Olei olivæ $\frac{3}{ii}$ 7·0 c.c.
 Unguenti zinci oxidi $\frac{3}{ss}$ 15·0 grm.

For relief of hay-fever.

FORMULA 78

℞ Ichthyol $\frac{3}{i}$ 4·0 grm.
 Coumarini gr. ii 0·13 grm.
 Unguenti paraffini $\frac{3}{v}$ 20·0 grm.

Antiseptic and sedative. Introduced into the nose in chronic coryza and ozæna.

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